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Non-Native Invasive Species Resource Report

For the Fourmile Vegetation Management Project

Chequamegon-Nicolet National Forest
Eagle River-Florence Ranger District

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Executive Summary

This report analyzes how the proposed actions and connected actions in the Fourmile Vegetation Management Project would affect the introduction, establishment, spread, and persistence of Non-Native Invasive Plant (NNIP) species. Direct effects are measured by the proximity of proposed activities to NNIP infestations (within ¼ mile) and travel through infestations. Indirect effects are measured by soil disturbance (acres) and light availability (acres) resulting from the proposed activities. The analysis area for direct and indirect effects is the Fourmile project area. Cumulative effects are measured by the amount and/or percent of soil disturbance (acres), light availability (acres) and net change in roads (miles) from the proposed activities in conjunction with other past, present, and reasonably foreseeable projects that overlap at a given scale. The scale used to analyze and compare cumulative effects are the Fourmile project area and the Eagle River-Florence Ranger District (ER-FL RD).

Within the Fourmile project area, there are 467 recorded invasive species infestations comprised of 16 different species totaling 443 infested acres (2,214 gross acres). Excluding stands with winter only harvest restrictions, there are 140 stands totaling 4,452 acres (38.1% of proposed stands) proposed for treatment in Alternative 2 infested with NNIP that have an elevated risk of NNIP spread. And an additional 210 stands totaling 3,289 acres (28.1% of proposed stands) proposed for treatment in Alternative 2 are within ¼ mile of documented NNIP infestations and have an elevated risk of NNIP introduction (stands with winter only harvest restrictions have been excluded).

There are 45.9 miles of proposed road actions in the Fourmile project area that contain or are adjacent to documented NNIP infestations and have an elevated risk of NNIP spread. An additional 108.0 miles of proposed road actions are within ¼ mile of documented NNIP infestations and have an elevated risk of NNIP introduction. The Fourmile project proposes a net reduction of roads in the project area by 145.8 miles, reducing the risk of NNIP spread by vehicle vectors.

Alternative 2 proposes to treat 5,285 acres in 173 stands that would have a negligible canopy effect, resulting in a slight risk of establishment and persistence of shade intolerant NNIP. 4,173 acres in 202 stands are proposed for treatment that would have a short-term canopy effect (\leq five years), resulting in an increased risk of establishment and persistence of both shade tolerant and intolerant NNIP. And 2,237 acres in 135 stands are proposed for treatment that would have a long-term canopy effect (\geq 50 years) resulting in a high risk of establishment and persistence of shade intolerant NNIP. The total soil disturbance caused by proposed treatments (1,551 acres) and road activities (89 acres) in Alternative 2 is 1,640 acres, which is approximately 3.7% of all NFS lands in the Fourmile project area. The risk of establishment, persistence, and spread of NNIP will be increased in these areas.

Alternative 2 results in 3.7% more cumulative soil disturbance in the Fourmile project area and 0.5% more total soil disturbance in the ER-FL RD when compared to Alternative 1. The cumulative light availability as a result of the proposed activities in Alternative 2 increases by 14.6% in the Fourmile project area and 2.0% in the ER-FL RD when compared to Alternative 1. Light availability effects can be expected to last until canopy closure rebounds to 80% in five to 50 years. Cumulative road change as a result of the proposed activities in Alternative 2 is reduced by 35.0% in the Fourmile project area and 5.5% in the ER-FL RD when compared to Alternative 1. It is assumed that the net reduction in roads would halt motorized traffic, reducing the risk of NNIP spread by vehicle vectors. The effects of implementing Alternative 2 when added to the effects of past, present, and reasonably foreseeable actions are not expected to result in appreciable adverse cumulative effects relative to NNIP.

Given project implementation would follow Forest Plan standards and guidelines and specific design features, actual potential for NNIP spread, introduction, establishment, and persistence as a result of project actions is reduced. The activities in Alternative 2 are not anticipated to contribute to the direct spread or exceed a low risk of introduction of NNIP in the project area. Without implementation of project design features, Alternative 2 would directly and indirectly increase the risk of spread and/or introduction of NNIP. Considering the extent of NNIP infestation in the Fourmile project area, the Forest Service would rely extensively on these standards, guidelines, and specific design features to minimize NNIP spread.

1.0 Introduction

1.1 Issue

The cost associated with non-native invasive species (NNIS) in the United States (US) is an estimated \$120 billion annually (Pimentel et al., 2005). Many of the 4,300 invasive species in the US have the potential to severely impact the economy, environment and human health. NNIS have the capacity to completely alter and transform native communities and the ecological processes occurring within them. Non-native invasive plants (NNIP) out-compete and displace native species, interfere with native plant germination and survival, alter soil and hydrological functions, change microclimate features, and contribute to a host of other factors that can dramatically alter vegetation composition and structure (USDA Forest Service, 2005). Although NNIP have the potential to colonize and invade almost any environment, disturbed areas tend to be more susceptible to invasion and retention of these species. When any ground disturbing activity is proposed, the Forest Service must determine the risk of introducing or spreading noxious weeds associated with the proposed action. NNIP are known to occur within and adjacent to the Fourmile project area.

Practices associated with the proposed action(s) not only include the harvest treatment itself, but other related actions such as landings, skid trails, haul roads, and site prep. These actions have the potential to alter the physical site conditions and disrupt the soil surface and existing vegetation, providing an ideal habitat for invasive plants. The proposed activities could increase the risk of NNIP introduction and expansion by altering physical site conditions (increased light and soil exposure will create suitable habitat for invasion), by altering disturbance regimes (frequent disturbance associated with road traffic and maintenance will create a continuous opportunity for introduction and establishment), by disrupting existing vegetation (the reduced competitiveness of native species will promote establishment), and by increasing dispersal ability and probability of chance introductions (roads act as corridors for dispersal via animal and human vectors) (Hansen & Clevenger, 2005; Parendes & Jones, 2000; Trombulak & Frissell, 2000; Von Der Lippe & Kowarik, 2007; Watkins et al., 2003;).

Exotic earthworms from Europe and Asia are also considered a NNIS in Wisconsin (Bohlen et al., 2004). Exotic earthworms can have a profound negative effect on understory plants in northern hardwood ecosystems by altering soil properties (reducing and eliminating the surface organic layer and altering the composition and abundance of soil biota) and diminishing seed germination and seedling survival (Bohlen et al., 2004; Gundale, 2002; Hale et al., 2006; Lawrence et al., 2003). The Chequamegon-Nicolet National Forest (CNNF) does not actively track earthworm infested stands, however their presence/absence within a stand may be inferred from notes taken during surveys for Regional Forester Sensitive plant Species (RFSS). Additionally, there currently is not a method for treating infested stands on a landscape level.

1.2 Background

The February 1999 Executive Order on Invasive Species requires Federal agencies to use relevant programs and authorities to prevent the introduction of invasive species and not authorize or carry out actions that are likely to cause the introduction or spread of invasive species (Executive Order 13112, 1999). This policy directs federal agencies to:

- Prevent the introduction of invasive species.
- Detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner.
- Monitor invasive species populations accurately and reliably.
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded.
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species.
- Promote public education on invasive species and the means to address them.

The Forest Service identified prevention of the introduction and establishment of noxious weed infestations as an agency objective, which lead to the creation of the “Guide to Noxious Weed Prevention Practices,” in 2001 (USDA Forest Service, 2001). This policy directs the Forest Service to:

- Determine the factors that favor establishment and spread of noxious weeds.
- Analyze weed risks in resource management projects.
- Design management practices that reduce these risks.

In 2003 the Forest Service implemented a national Forest Service invasive species program to guide the Forest Service as it takes on invasive species’ threat to our Nation’s forest and rangeland ecosystems through the “National Strategy and Implementation Plan for Invasive Species Management,” (USDA Forest Service, 2004a). The Forest Service revised this document in 2013 to the “Forest Service National Strategic Framework for Invasive Species Management,” (USDA Forest Service, 2013). This document provides broad and consistent strategic direction on the prevention, detection, and control of invasive species that threaten our Nation’s terrestrial and aquatic ecosystems across all facets of the Forest Service. The specific strategy outlined in this document is:

- Prevention-Keeping invasive species out.
- Detection-Survey to detect new invasive species and monitor existing priority species.
- Control and Management-Directly eradicate (if possible), control, or manage priority invasive species on priority acres to minimize their spread and adverse effects.
- Restoration and Rehabilitation-Minimize or reverse adverse ecosystem effects caused by invasive species.

Additional guidance, direction, and policy for management of invasive species across the National Forest System (NFS) lands, including determining the risk of introducing, establishing or spreading invasive species associated with a proposed action, as an integral component of project analysis, and where necessary provide for alternatives or mitigation measures to reduce or eliminate that risk, can be found in the Forest Service Manuals (FSM) and the Forest Service Handbook (FSH).

The CNNF Land and Resource Management Plan (hereafter referred to as the Forest Plan) provides direction for the management of NNIS on the CNNF (USDA Forest Service, 2004b). The Forest Plan outlines the following standards and guidelines:

Non-Native Invasive Species Standards:

- Use permissible mechanical, biological, and chemical controls to reduce the spread of non-native invasive species.

Non-Native Invasive Species Guidelines:

- Avoid the placement of log landings in areas infested with non-native invasive plant species.
- Consider non-native invasive plant species treatment when planning prescribed burn projects in areas of heavy weed infestation.
- Minimize the need for prescribed burn area fire lines and soil disturbance by using existing barriers where possible.
- Utilize staging areas and helispot facilities (for prescribed burning) that are free of non-native invasive plant species.

Roads Management and Related Soils and Vegetation Impacts Guidelines:

- Plant native or desirable non-native plant species where vegetative cover is needed to stabilize slopes or decommission a travel way.
- Insure, to the extent practicable, that road fill and gravel sources do not contain non-native invasive plant species.

- Plant native or desirable non-native species immediately after road construction or reconstruction, where natural re-vegetation is unlikely, or sedimentation and erosion are concerns.

A contractual equipment cleaning clause commonly used on western forests, both in vegetation management and wildland fire related activities, is considered to be an effective means of slowing the spread of NNIP (USDA Forest Service, 2002). Timber harvesting activities in the Fourmile project would be implemented using a similar equipment cleaning clause, reducing the amount of soil moved between sites, thus reducing the risk of NNIP propagule (seeds, root fragments, etc.) and exotic earthworms (cocoons, eggs, etc.) introduction.

In addition to agency and forest plan direction, the CNNF currently implements two separate Forest-wide projects to manage NNIP:

- CNNF Non-native, Invasive Species Control Project for Administrative and Recreation Sites, Roads and Trails, Categorical Exclusion (USDA Forest Service, 2004c).
- CNNF Invasive Plant Control Project, Environmental Assessment (USDA Forest Service, 2005), which is updated annually to reflect new NNIP inventory data.

Continuous NNIP inventory efforts on the CNNF are intended to detect new infestations and control them early in the invasion process in order to prevent further spread and introductions. Additionally, the CNNF continues to collect monitoring data on vegetation treatments and NNIP control efforts to assess the effectiveness of both the design features and NNIP control projects. Both NNIP inventory and monitoring efforts are independent of the Fourmile project proposal and will occur regardless of project implementation.

The CNNF has developed a list which categorizes NNIP as (see Appendix A):

- Category A: Species of immediate concern. These species are documented on the CNNF (or within proclamation boundary) and are currently invading native plant communities. Includes those Wisconsin Department of Natural Resources (WI DNR) NR-40-listed plants that have been found on CNNF as of 2015. Control is warranted; for some species initiating control depends on location.
- Category B: Species known to be invasive and present within the CNNF; invasion in natural communities is uncertain. Record and map all sites, monitor, control under certain circumstances such as high priority sites. These species are not listed by WI DNR NR-40. This list will change as new species are discovered.
- Category C: Species to watch for. Species known to be ecologically invasive, but are not yet documented on the CNNF. If found on the CNNF they need to be documented and mapped. If detected they will likely be added to the "A List".

This report analyzes the risk of introduction of the species listed in Appendix A to the Fourmile project area from sources within the ER-FL RD, and the risk of spread of known infestations within the Fourmile project area due to the proposed actions.

1.3 Existing Condition

It is unknown when NNIP became established within the Fourmile project area, but Wisconsin State Herbarium (WIS) records indicate the earliest recorded specimens in the Wisconsin were in the late 1870's and early 1880's (WIS, 2019). Past activities (agriculture, timber harvest, recreation, road construction and maintenance, etc.) most likely contributed to the establishment and spread of these species. The oldest documented infestation in CNNF dates back to 1997. Formal NNIP inventory on lands within the CNNF boundary and the Fourmile project area began in 2000. Since the establishment history of NNIP is unknown and cannot be inferred from existing records, they have been integrated into the existing condition.

Currently there are 3,313 separately recorded NNIP infestations on the ER-FL RD, comprised of 27 different species over approximately 8,568 gross acres totaling 2,450 infested acres. The majority of these NNIP sites are in road corridors, gravel pits, log landings, and wildlife openings. Humans are the main vector of NNIP introduction and spread, (road maintenance equipment, logging vehicles, and passenger cars and trucks,

recreational vehicles, etc.), although the seeds of many species are also wind or animal dispersed. Within the Fourmile project area, there are 467 recorded invasive species infestations comprised of 16 different species over 2,214 gross acres totaling 443 infested acres (see Table 1). The species present within the Fourmile Project area are: bishop's goutweed (*Aegopodium podagraria*), garlic mustard (*Alliaria petiolata*), lesser burdock (*Arctium minus*), Japanese barberry (*Berberis thunbergii*), spotted knapweed (*Centaurea stoebe*), Canada thistle (*Cirsium arvense*), European marsh thistle (*Cirsium palustre*), bull thistle (*Cirsium vulgare*), leafy spurge (*Euphorbia esula*), common St. Johnswort (*Hypericum perforatum*), exotic honeysuckle (*Lonicera* spp.), garden forget-me-not (*Myosotis sylvatica*), reed canary grass (*Phalaris arundinacea*), common tansy (*Tanacetum vulgare*), garden valerian (*Valeriana officinalis*), and common mullein (*Verbascum thapsus*).

All Category A species (see Appendix A) that occur at high densities or are likely to be affected by the proposed action were considered for this analysis. Category B species (see Appendix A) are present within the project area, however their ability to invade natural communities is uncertain and most were not considered for analysis, including lesser burdock and common St. johnswort. Species present within the project area, but do not occur in proximity to proposed actions or connected actions were excluded from this analysis, including garden forget-me-not and garden valerian. Common mullein has also been excluded from this analysis because it is common place across the ER-FL RD and occurrences tend to be in open disturbed areas such as roadsides, gravel pits, and waste areas and not in natural communities.

Table 1: Number of known infested sites (N) and respective gross and infested area (acres) by species within the Fourmile project area. Gross area is the total area covered by an infestation, while infested area is the gross area multiplied by the percent canopy cover of. For example, if an invasive species infestation spans five acres but only infests 10 percent of this area, the infested area is 0.5 acres. Species designated with an asterisks (*) were excluded from this analysis.

Scientific Name	Common Name	Code	Sites (N)	Gross Area	Infested Area
<i>Aegopodium podagraria</i>	bishop's goutweed	AEPO	2	1.1	0.9
<i>Alliaria petiolata</i>	garlic mustard	ALPE4	13	835.3	63.6
<i>Arctium minus</i> *	lesser burdock	ARM2	1	0.0	0.0
<i>Berberis thunbergii</i>	Japanese barberry	BETH	1	0.0	0.0
<i>Centaurea stoebe</i>	spotted knapweed	CEST8	53	152.4	64.5
<i>Cirsium arvense</i>	Canada thistle	CIAR4	68	80.6	24.9
<i>Cirsium palustre</i>	European marsh thistle	CIPA6	146	487.3	142.6
<i>Cirsium vulgare</i>	bull thistle	CIVU	44	56.1	13.2
<i>Euphorbia esula</i>	leafy spurge	EUES	4	18.7	5.0
<i>Hypericum perforatum</i> *	common St. johnswort	HYPE	9	15.2	4.1
<i>Lonicera</i> spp.	Exotic bush honeysuckles	LONIC	1	1.2	0.0
<i>Myosotis sylvatica</i> *	garden forget-me-not	MYAR	3	0.3	0.0
<i>Phalaris arundinacea</i>	reed canarygrass	PHAR3	56	355.5	90.6
<i>Tanacetum vulgare</i>	common tansy	TAVU	10	28.5	7.2
<i>Valeriana officinalis</i> *	garden valerian	VAOF	1	0.0	0.0
<i>Verbascum thapsus</i> *	common mullein	VETH	55	182.0	26.2
Total			467	2,214.2	442.9

Aegopodium podagraria (Bishop's goutweed)

A shade-tolerant, rhizomatous perennial forb from Europe and northern Asia brought to the US as an ornamental during the early stages of European settlement (Garske & Schimpf, 2005). Bishop's goutweed is found throughout the northeastern U.S. from Maine south to Georgia and west to Missouri and in Pacific Northwest (NatureServe, 2019a). Known to invade forests, forest edges, garden and other disturbed areas such as felled forests, abandoned fields, and pastures. Bishop's goutweed prefers moist soils and light to moderate shade, but is highly shade-tolerant (Garske & Schimpf, 2005).

Bishop's goutweed seeds are not long lived in the seed bank, typically germinating the year following ripening. Additionally the seeds do not have any morphological features that would facilitate dispersal. Aggressive vegetative reproduction via rhizomes creates dense patches. Its shade tolerance coupled with its vigorous vegetative spread allow Bishop's goutweed to displace and out compete native vegetation greatly reducing ground layer diversity (Garske & Schimpf, 2005). Humans are the primary vector for Bishop's goutweed dispersal.

There are two known Bishop's goutweed sites (1.1 gross acres; 0.9 infested acres) in the Fourmile project area located along a recreational trail system on NFS lands (see Table 1). Activities are not proposed in stands infested with Bishop's goutweed (see Appendices B and C).

Alliaria petiolata (Garlic mustard)

A biennial, shade-tolerant forb, introduced into North America during the mid-1800s from western Eurasia for its ethnobotanical uses (Rodgers et al., 2008). An invader of forested communities throughout the eastern U.S. from Maine south to Georgia and west to Nebraska (NatureServe, 2019b). Garlic mustard typically invades high quality, shaded forests and savannas, but will occasionally invade disturbed areas such as yards, roadsides and more open, sunny habitats (Panke & Renz, 2012a). Unlike other NNIP, garlic mustard readily spreads into high quality otherwise-undisturbed forests and does not necessarily require disturbance to become established or proliferate (Rodgers et al., 2008).

Garlic mustard exudes secondary, antifungal chemicals that disrupt symbiotic relationships between mycorrhizal fungi and native plants, interfering with native plant germination and growth (Panke & Renz, 2012a; Rodgers et al., 2008). Garlic mustard's rapid spread and allelopathy allow it to dominate the forest floor and displace most native herbaceous species within ten years. This plant is a major threat to Wisconsin's woodland herbaceous flora and the wildlife that depend on it. Garlic mustard spreads exclusively by seed and rate of spread is therefore a function of seed production and dispersal (Nuzzo, 1999). The invasion of forests usually begins along forested edges and progresses via streams, campgrounds, roads and trails.

There are 13 known garlic mustard sites (835.3 gross acres; 63.6 infested acres) in the Fourmile project area located along three different recreational trail systems on both private and NFS lands and along road ways on NFS lands (see Table 1). There are six stands proposed for selection harvest (800 acres) and two stands proposed for thinning (132 acres) that are infested with garlic mustard under Alternative 2 (see Appendices B and C).

Berberis thunbergii (Japanese barberry)

A spiny, deciduous, understory shrub native to Japan and introduced to North America as an ornamental shrub during the late 1800s (Silander & Klepeis, 1999). An invader of a variety of natural and disturbed areas across the northeastern part of the US, from Maine south to Georgia and west to Wyoming (NatureServe, 2019c). Japanese barberry tolerates a broad range of light and soil conditions (Silander & Klepeis, 1999) invading woodland edges, roadsides, stream banks, old fields and forests (MI DNR MI NFI, 2012).

Japanese barberry reproduces through seed production and vegetatively. Seeds are predominantly dispersed by birds (Silander & Klepeis, 1999). Vegetative reproduction occurs through below ground clonal shoots and rooting above ground branches (MI DNR MI NFI, 2012). Japanese barberry leafs out earlier and retains leaves longer than native vegetation resulting in a longer growing season (Silander & Klepeis, 1999). The extended growing season coupled with the tolerance for a broad range of light and soil conditions gives Japanese barberry a competitive advantage.

There is one known Japanese barberry site (1.1 gross acres; 0.9 infested acres) in the Fourmile project area located in the interior of one stand on NFS land (see Table 1). Activities are not proposed in stands infested with Japanese Barberry (see Appendices B and C).

Centaurea biebersteinii (Spotted knapweed)

A winter hardy, biennial or short lived perennial with deep taproots native to Eastern Europe and Asia, introduced to the North America in the early 1900s as a contaminant in alfalfa and ship ballast (Carpinelli, 2005). Spotted knapweed is an invader of both disturbed and natural areas across the continental US (NatureServe, 2019d). Spotted knapweed is tolerant of a wide range of soils from rich damp soils to extremely nutrient poor, dry soils and grows in a wide variety of habitats. It is most aggressive in open semi-arid areas with coarse-textured soils like dry prairies, barrens, semi-open woodlands and disturbed areas, where it rapidly colonizes and outcompetes and displaces native vegetation (Carpinelli, 2005).

Spotted knapweed is allelopathic; chemical compounds are exuded through the roots that inhibit the growth of adjacent vegetation (Panke et al., 2012). Spotted knapweed reproduces through copious seed production and vegetatively via lateral shoots. Short distance seed dispersal occurs by wind, while long distance dispersal occurs by animal and human vectors. Seeds remain viable in the soil for approximately seven years (Sheley et al., 1998).

There are 53 known sites of spotted knapweed (152.4 gross acres; 64.5 infested acres) in the Fourmile project area located primarily along roads/routes, but also in openings across the project area on both private and NFS lands (see Table 1). There are 55 stands (1,708 acres) infested with spotted knapweed that are proposed for treatment under Alternative 2 (see Appendices B and C).

Cirsium arvense (Canada thistle)

A prickly, erect, rhizomatous perennial native to Europe, Asia, and northern Africa accidentally introduced in contaminated hay and grain seed to the US in the 1600s (Lym & Christianson, 2013; Thunhorst & Swearingen, 2005; Winston et al., 2008). Canada thistle is an invader of both disturbed and natural areas throughout the US, including Alaska, and Canada (NatureServe, 2019e). Invades open natural areas such as prairies, savannas, dunes, streambanks, meadows, and forest openings and disturbed areas such as croplands, pastures, lawns, roadsides and ditches (Panke & Renz, 2012b).

Canada thistle has allelopathic effects on competing vegetation (Thunhorst & Swearingen, 2005; Winston et al., 2008). Canada thistle reproduces through copious seed production and aggressive vegetative reproduction via rhizomes. Seeds are primarily wind distributed and typically germinate within a year, but can remain viable in the soil for up to twenty years (Thunhorst & Swearingen, 2005). The creeping lateral rhizomes can grow up to twelve inches a year (Panke & Renz, 2012b) and readily regenerates from root fragments as small as 1/4 inch long by 1/8 inch in diameter (Winston et al., 2008). Vigorous vegetative and sexual reproduction coupled with allelopathy, allow Canada thistle to crowd out and replace native vegetation creating dense monotypic stands.

There are 68 known sites of Canada thistle (80.6 gross acres; 24.9 infested acres) in the Fourmile project area located primarily along roads/routes, but also in openings across the project area on both private and NFS lands (see Table 1). There are 37 stands (1,687 acres) infested with Canada thistle that are proposed for treatment under Alternative 2 (see Appendices B and C).

Cirsium palustre (European marsh thistle)

A shade tolerant, spiny biennial native to Europe and Western Asia introduced to the US during the early 1900s (Winston et al., 2008). Invader of both disturbed and natural areas in the upper Midwest and northeast areas of the US (NatureServe, 2019f). Prefer moist, acidic soils, but found in and along roadsides, old fields, forest edges, wetlands, stream banks, meadows, beaches and dune areas (Panke et al., 2013b). European marsh thistle has the potential to aggressively colonize natural areas, compromising the ecological integrity once established (Panke et al., 2013b). Reproduction is exclusively by seed that is primarily wind dispersed.

There are 146 known sites of European marsh thistle (487.3 gross acres; 142.6 infested acres) in the Fourmile project area located primarily along roads/routes and in openings scattered across the project area on both private and NFS lands (see Table 1). There are 107 stands (4,807 acres) infested with European marsh thistle that are proposed for treatment under Alternative 2 (see Appendices B and C).

Cirsium vulgare (Bull thistle)

A spiny biennial native to Europe, western Asia, and northern Africa introduced to the US during the late 1800s (Winston et al., 2001). An invader of open disturbed and natural areas throughout the entire US, including Alaska and Hawaii, and much of Canada (NatureServe, 2019g). Bull thistle invades prairies, savannas, dunes, stream banks, meadows, and forest openings, lawns, roadsides, ditches and waste sites (Panke et al., 2013b). Bull thistle does well on neutral soils with moderate moisture and does not grow well in shade and drought conditions (Winston et al., 2008). Bull thistle does not reproduce vegetatively (Winston et al., 2008); reproduction is exclusively by seed that is primarily wind dispersed.

There are 44 known sites of bull thistle (56.1 gross acres; 13.2 infested acres) in the Fourmile project area located primarily along roads/routes, but also in openings scattered across the project area on both private and NFS lands (see Table 1). There are 30 stands (1,447 acres) infested with bull thistle that are proposed for treatment under Alternative 2 (see Appendices B and C).

Euphorbia esula (Leafy spurge)

A creeping, long lived perennial forb native to Eurasia, introduced to the US during the early 1800s as either an ornamental or as a contaminant in imported grain or ballast water (Goodwin et al., 2003). An invader found throughout most of the US, excluding the southeast, and much of Canada (NatureServe, 2019h). Leafy spurge invades a variety of dry and moist habitats (Goodwin et al., 2003), including grasslands, pastures, prairies, and old fields. (Panke et al., 2013a). Leafy spurge has the potential to be especially aggressive on dry and disturbed areas (Goodwin et al., 2003).

Leafy spurge reproduces through seed production and aggressive vegetative reproduction via rhizomes. Seeds are primarily dispersed via exploding capsules (Goodwin et al., 2003; Messersmith et al., 1985) and secondarily by water and animals (Messersmith et al., 1985). Seeds are viable in the soil seed bank for up to 8 years (Messersmith et al., 1985). Extensive root systems can extend 26 feet deep and 15 feet out (Goodwin et al., 2003). Roots have numerous buds and readily regenerates from root fragments (Messersmith et al., 1985). Vigorous vegetative reproduction coupled with allelopathy (Messersmith et al., 1985) give leafy spurge a competitive advantage.

There are four known sites of leafy spurge (18.7 gross acres; 5.0 infested acres) in the Fourmile project area, primarily along Scott Lake Rd on the NFS lands (see Table 1). There is one stand proposed for selection harvest (133 acres) in the Argonne Experimental Forest and three stands proposed for thinning (46 acres) that are infested with leafy spurge under Alternative 2 (see Appendices B and C).

Lonicera spp. (Exotic bush honeysuckles)

Exotic bush honeysuckles are a collective of several different species of upright, multi stemmed, deciduous shrubs native to Asia and Europe that were introduced to the US as early as the mid-1700s for horticultural and hedge row purposes (Rich, 2000). Exotic bush honeysuckles are found throughout the US (Kurtz & Hansen, 2015) and invade a broad range of communities including disturbed areas like forest edges, roadsides, pastures, and old fields and undisturbed areas like forests, fens and bogs (Panke & Renz, 2012c).

Exotic bush honeysuckles are not known to spread vegetatively by root sprouts (Rich, 2000), so reproduction is exclusively by seed. Exotic bush honeysuckles produce an abundance of fruit that is primarily dispersed by birds (Kurtz & Hansen, 2015). Exotic bush honeysuckles have an extended growing season compared to native species as they leaf out earlier and retain leaves later (Kurtz & Hansen, 2015). The extended growing season coupled with ability to invade a wide variety of sites contribute to the proliferation of exotic bush honeysuckle.

There is one known exotic honeysuckle (1.2 gross acres; 0.0 infested acres) site in the Fourmile project area located in the interior of one stand on NFS land (see Table 1). There is one stand proposed for selection harvest (13 acres) infested with exotic honeysuckle under Alternative 2 (see Appendices B and C).

Phalaris arundinacea (Reed canarygrass)

A circumboreal cool-season perennial grass native to Europe, Asia, and North America, reed canarygrass was first cultivated for forage in the US during the mid-1800s with active breeding improvement efforts occurring during the early 1900s (Jakubowski et al., 2013). Reed canarygrass has also been used extensively across the US for soil stabilization and remediation efforts since the 1930s (Casler, 2010; Jakubowski et al., 2013). The presence of both native and European cultivars has confounded the origin of invasiveness in reed canarygrass. Additionally, a lack of obvious morphological characteristics between the native and European cultivars of reed canarygrass makes distinguishing between the two difficult. An invader of wet habitats across the US, from Maine west to California and south to Alabama (NatureServe, 2019i). Reed canarygrass is an invader of wet sites such as wetlands, riparian areas, shorelines, canals and ditches, and exhibits a wide tolerance to temperature, moisture, and salinity extremities (Casler, 2010).

Reed canarygrass reproduces through seed production and vegetative rhizomes. It produces a high yield of seed annually (Lavergne & Molofsky, 2004), which are dispersed long distances by floating on water (Casler, 2010). Reed canary grass has an extensive network of underground rhizomes that allow for aggressive spread that ultimately displace native vegetation and result in the formation of dense monotypic stands (Lavergne & Molofsky, 2004).

There are 56 known sites of reed canarygrass (355.5 gross acres; 90.6 infested acres) in the Fourmile project area located primarily along roads/routes across the project area on both private and NFS lands (see Table 1). There are 45 stands (1,669 acres) infested with reed canarygrass that are proposed for treatment under Alternative 2 (see Appendices B and C).

Tanacetum vulgare (Common tansy)

A robust, perennial herb native to Europe and Asia introduced to the US during early colonization of the early 1600s for a variety of ethnobotanical uses (Jacobs, 2008; Mitch, 1992). An invader of open areas across much of the US, from Maine west to California and south to Georgia and Louisiana (NatureServe, 2019j). Invades disturbed areas such as roadsides, fields, prairies, pastures, hedgerows, and gardens and naturally disturbed areas like flood scoured banks and shores. Common tansy prefers open areas with well drained, sandy or loamy soils (Panke & Renz, 2013).

Common tansy reproduces through seed production and vegetative means. (Jacobs, 2008; Panke & Renz, 2013). Long distance seed dispersal occurs via wind, water, and animal vectors while short distance dispersal occurs via creeping rhizomes (Jacobs, 2008; Panke & Renz, 2013). Common tansy tends to form near monotypic stands on low productivity sandy soils where it is a superior competitor. (Jacobs, 2008). Common tansy plants contains a suite of chemicals that deter herbivory (Jacobs, 2008) and are harmful to livestock and humans if consumed in large quantities (Panke & Renz, 2013).

There are ten known sites of common tansy (28.5 gross acres; 7.2 infested acres) on NFS lands in the Fourmile project area located primarily along roads/routes across the project area on both private and NFS lands (see Table 1). There are two stands proposed for selection harvest (14 acres), one stand proposed for shelterwood harvest (42 acres), and three stands proposed for thinning (57 acres) that are infested with common tansy under Alternative 2 (see Appendices B and C).

1.4 Measures

All soil disturbing activities result in some degree of increased risk of NNIP introduction, spread, and establishment. All habitats inherently have a low risk of NNIP invasion, regardless of which activities may be implemented. Since a low risk is always present, this report will only analyze those areas that are at risk of introduction, spread, establishment, and/or persistence of NNIP through project related activities.

1.4.1 Direct Effects

For the purpose of this analysis, direct effects will be defined as the risk of introduction and/or spread of NNIP within the project area. More narrowly, the expansion or dispersal of current NNIP infestations as a result of project activities. Direct effects will be measured by:

1. The proximity of known infestations (within ¼ mile) to proposed activities.
2. The amount of travel through infestations spreading propagules directly adjacent to infestations.

1.4.2 Indirect Effects

For the purpose of this analysis, indirect effects will be defined as the risk of establishment and/or persistence of NNIP within the project area. More narrowly, the likelihood that habitat becomes more suitable for the establishment and/or persistence of NNIP as a result of project actions. Indirect effects will be measured by:

1. The area of soil disturbance resulting from harvest treatment(s) (acres) and road activities (miles).
2. The area of harvest treatments (acres) that will alter canopy closure and thus alter the physical environment (light availability).

1.4.3 Cumulative Effects

Cumulative effects are analyzed using the proposed activities of this project in conjunction with other past, present, and reasonably foreseeable activities that have or will occur on ER-FL RD that may have impacts on NNIP. Cumulative effects will be measured by:

1. The area of soil disturbance resulting from the harvest treatment(s) (acres) and road activities (miles).
2. The area of harvest treatments (acres) that will alter canopy closure and thus alter the physical environment (light availability).
3. The net change in roads (miles) resulting from the proposed road activities.

1.5 Thresholds

The Forest Plan does not define thresholds for NNIP. The Forest Plan standard for NNIP requires the use of permissible measures to reduce spread of NNIP (USDA Forest Service, 2004b), which implies a general, forest-wide reduction of NNIP spread over time. The thresholds defined for this analysis are:

1. Direct Spread: There will be no spread of known infestations directly due to proposed actions.
2. Indirect Spread: Will not exceed a low risk of new introductions due to proposed actions.

1.6 Methodology

1.6.1 Surveys

Data for the NNIP analysis were obtained from continual ongoing NNIP surveys conducted at the forest and district levels that began in 2000. As areas are surveyed and resurveyed, new infestations are inventoried and recorded and existing infestations are monitored and updated. The Fourmile project area was intensively surveyed for NNIP during the 2017 and 2018 field seasons. The survey data was entered into Natural Resource Manager (NRM) database, an agency-wide corporate database for storing, managing, and retrieving data. From this database, NNIP infestation and locational data was exported into a geographic information system (GIS) layer for further analyses. The data used for this analysis was updated with currently known populations through the 2018 field season.

1.6.2 Boundary and Scale of Effects Analyses

The analysis area for direct and indirect effects is the Fourmile project area boundary. The analysis area for cumulative effects is both the Fourmile project area and ER-FL RD. The ER-FL RD is an appropriate scale to analyze cumulative effects because 1) project activities have and will continue to occur across the district, 2)

the effects of the project become negligible outside the district boundary, 3) it provides a measurable comparison between the district and the project area, 4) there are many infestations across the district, yet exponentially more infestations at larger scales, and 5) the small area of the project area is relatively insignificant when compared to larger areas such as the entire CNNF or the state of Wisconsin.

1.6.3 Activities Analyses

Practices associated with the proposed treatments not only include the harvesting treatment, but other related actions such as mechanical site preparation (MSP) and aspen site preparation (ASP) used for regeneration and planting, construction of landings, skid trails, and temporary roads and road maintenance and decommissioning. The treatment and associated actions have the potential to alter the physical site conditions and disrupt the soil and existing vegetation, directly and indirectly increasing the risk of introduction and spread of NNIP.

1.6.3.1 Proximity (Direct Effects)

The risk of NNIP introduction is related to the distance between proposed activities and NNIP infestations. The risk of NNIP introduction and invasion is greatest when project activities are located within or adjacent to an NNIP infestation and thus a propagule source. The closer an NNIP infestation is to a proposed activity and soil disturbance, the higher the quantity of propagules introduced and the higher the probability of establishment. Proposed activities can increase the risk of spread of NNIP directly, by exposing an existing seed bank for future propagation and by increasing dispersal ability and probability of chance introductions.

1.6.3.2 Light Availability (Indirect & Cumulative Effects)

Proposed activities can increase the risk of spread of NNIP indirectly, by creating a favorable habitat for invasion by altering physical site conditions, altering disturbance regimes, and disrupting and removing existing vegetation (Hansen & Clevenger, 2005; Parendes & Jones, 2000; Trombulak & Frissell, 2000; Von Der Lippe & Kowarik, 2007). Altered physical site conditions that would increase the risk of spread of NNIP that may result from the proposed activities include reduced canopy closure and thus increased light infiltration (Christen & Matlack, 2006; Silveri et al., 2000).

The effects of light availability and thus NNIP habitat suitability vary depending on the residual canopy cover left by proposed timber harvest and the NNIP infestation. The vast majority of NNIP are shade intolerant and thrive in open conditions, like Canada thistle, common tansy, and spotted knapweed. There are also some NNIP that are shade tolerant and thrive under a closed canopy, such as garlic mustard and bishop's goutweed. Some species like marsh thistle are habitat generalists and flourish in both extremes.

Individual tree selection harvests with canopy gaps and precommercial thinning (PCT) maintain canopy closure at around 80% and do not significantly alter light availability. While maintaining canopy closure limits the risk of establishment and persistence of shade intolerant species, it may sustain the risk of persistence and spread of shade tolerant and habitat generalist NNIP that occur there. Other uneven aged treatments, such as selection harvests occurring in the Argonne Experimental Forest, and thinning and improvement harvests, reduce canopy closure to around 75% which will recover to 80% in about five years. The short-term reduction in canopy closure results in a slight increased risk of establishment and persistence of shade intolerant species. However the greater risk is the risk of persistence and spread of shade tolerant and habitat generalist NNIP that occur there. Shade tolerant NNIP infestations persisting under an intact canopy, regardless of harvest method, would require treatment to control their spread. Shelterwood harvests reduce canopy closure to 30% to 50%, depending on the species targeted for regeneration, and even aged treatments such as clearcuts and canopy removal reduce the average canopy cover to 10% or below. The effects of these treatment harvests, reduced canopy cover and increased light availability, are assumed to have a long term effect, lasting at least 50 years. Shelterwood, canopy removal, and clearcut harvests significantly increase the risk of the introduction and establishment of shade tolerant NNIP and the risk of spread of shade intolerant NNIP that occur there. Eventually, the canopy cover following shelterwood, canopy removal, and clearcut harvests will recover to 80%, infestations of established shade intolerant NNIP will recede and the risk of establishment, persistence, and spread of shade intolerant NNIP will diminish.

1.6.3.3 Soil Disturbance (Indirect & Cumulative Effects)

Proposed activities can increase the risk of spread of NNIP indirectly, by creating a favorable habitat for invasion by altering physical site conditions, altering disturbance regimes, and disrupting and removing existing vegetation (Hansen & Clevenger, 2005; Parendes & Jones, 2000; Trombulak & Frissell, 2000; Von Der Lippe & Kowarik, 2007). Soil disturbance associated with the proposed activities prepare a site for colonization and expansion by NNIP by stressing or removing existing vegetation, thus reducing competitive strength and creating gaps (Hansen & Clevenger, 2005; Parendes & Jones, 2000; Trombulak & Frissell, 2000; Von der Lippe & Kowarik, 2007), and modifying the soil profile by removing the duff layer and exposing mineral soil creating an open niche for invasion (Christen & Matlack, 2006; Silveri et al., 2000). The soil in an area infested by NNIP contains a reservoir of seed (seed bank) for future propagation and invasion (Parendes & Jones, 2000) and soil disturbance in areas with existing NNIP infestations can expose dormant NNIP seeds, allowing germination.

Soil disturbance and resultant exposed soil facilitate the germination of NNIP seeds and can create favorable conditions for establishment of NNIP propagules (Christen & Matlack, 2006; Silveri et al., 2000). Soil disturbance estimates in this analysis are based on percentages of the average soil disturbance that occurs from each proposed activity. The Forest soil scientist developed an estimate, based on current literature, CNMF reviews and reports, that 13% of the soil in each stand is disturbed from timber harvesting activities. Mechanical site preparation (MSP) activities result in 50% to 70% (63% average) soil disturbance within a stand. For the purpose of this analysis the average, 63% soil disturbance, will be used. Canopy gap creation and aspen site preparation (ASP) activities are manual and are assumed to result in no soil disturbance. Site preparation activities utilizing prescribed burning will be assumed to cause 100% soil disturbance, since there is the potential for complete removal of litter and duff across the entire stand. Since it is assumed that there will be a 100% soil disturbance associated with prescribed burning, soil disturbance that would have resulted from the creation of fire lines within the affected stand will be ignored. If a stand has multiple proposed activities, the activity with the higher percentage of soil disturbance will be utilized. For example, if a stand has a proposed shelterwood cut, 13% soil disturbance, and mechanical site preparation, 63% soil disturbance, the total soil disturbance for the stand will be 63% of the stand area.

Additional soil disturbance will likely occur during construction of new roads, reconstruction of existing roads and road decommissioning. This analysis assumes that the area (acres) of soil disturbance is 2.42 acres/mile (20 feet x 5,280 feet/mile ÷ 43,560 feet²/acre) for road construction and construction of temporary roads, 0.97 acres/mile (8 feet x 5,280 feet/mile ÷ 43,560 feet²/acre) for road reconstruction, and 0.07 acres/road segment (N) (200 feet X 16 feet ÷ 43,560 feet²/acre) for road decommissioning. Reconstruction of NFS and special use roads will occur within the existing road footprint and are assumed not to have any soil disturbance. Decommissioning of currently closed roads will not require any ground disturbing activities and will not result in any soil disturbance, while decommissioning of open and undetermined roads are assumed to result in soil disturbance.

The risk of introducing and spreading NNIP during winter only treatments is greatly reduced when compared to that of summer treatments (Wolf et al., 2008). Conducting winter only treatments with snow pack allows logging equipment to travel above the soil and seed bed without causing any disturbance. Conducting winter only treatments without snow pack, reduces the risk of introduction and spread less than summer treatments since the ground is presumably frozen and not prone to ruts or other major soil disturbance.

Stands are identified with winter-only harvest restrictions for the following reasons 1) are northern hardwood stands in a 2B Management Area 2) to reduce impacts to occupied RFSS habitat 2) to reduce impacts to sensitive soils, or 4) to reduce the risk of introduction and spread of NNIP within the stand. Stands identified with a winter or dry summer-fall seasonal operating restriction are assumed to be implemented during a dry summer-fall. This analysis assumes winter only harvest restrictions mitigate the effects of soil disturbance, however it should be noted that the effectiveness of these harvest restrictions in preventing NNIP spread is unclear at this time as there is little district monitoring data to assess their effectiveness. All stands proposed for harvest in the Fourmile project area infested with garlic mustard or stands that require travel through garlic mustard infestations for implementation, will be a winter only harvests to reduce the risk of moving garlic mustard seeds, as it is a high priority species.

1.6.3.4 Roads (Cumulative Effects)

Vehicle travel through infestations can spread NNIP propagules along road corridors from short to long distances (Hansen & Clevenger, 2005; Parendes & Jones, 2000; Trombulak & Frissell, 2000; Von der Lippe & Kowarik, 2007). A variety of vectors have the potential to transport NNIP propagules to and within the project area, including wind, flowing water, wildlife, passenger vehicles, off-highway vehicles, logging trucks and equipment, people, and pets. The enhanced airflow and higher vehicle speeds along road corridors can easily transport seeds (Hansen & Clevenger, 2005; Von der Lippe & Kowarik, 2007). Chance dispersal can result when vehicles traveling from urban to rural areas transport and introduce NNIP propagules to uninfested habitats (Von der Lippe & Kowarik, 2007). It is difficult to quantify the amount of traffic on highways, town roads and Forest Service roads, although improved roads generally have more traffic than the unimproved roads.

Road use will be analyzed in this report, quantitatively based on miles of road decommissioning and new road construction/re-construction. A net change in roads (miles) resulting from the proposed road activities will have a correlated effect on NNIP spread. It is assumed that a reduction in road mileage would reduce the spread of NNIS by reducing disturbance and vectors, while an increase in road mileage would promote spread of NNIS by increasing disturbance and vectors.

2.0 Findings

There is one action alternative (Alternatives 2) in the Fourmile project, in addition to the No Action alternative (Alternative 1). See the Fourmile Environmental Assessment for more information.

Table 2. Comparison of proposed treatments (acres) and resultant canopy effects by alternative, where N is the number of stands. The pre-commercial thinning and selection harvests and burning treatments will not reduce canopy closure below 80% and are negligible. The improvement, thinning and selection occurring in Argonne Experimental Forest harvests will reduce canopy closure to approximately 75% which will recover to 80% in about five years (short-term). Clearcut/coppice, overstory removal, restoration thinning, salvage/sanitation and shelterwood harvests reduce canopy closure $\leq 50\%$ which will recover to 80% in approximately 50 years (long-term).

Canopy Effect	Treatment	Alternative 1		Alternative 2	
		N	Area (acres)	N	Area (acres)
Negligible	None (Burn)	0	0	5	3
	Precommercial Thinning	0	0	4	92
	Selection	0	0	164	5191
	Subtotal	0	0	173	5285
Short Term	Improvement	0	0	8	263
	Selection (Argonne)	0	0	16	526
	Thinning	0	0	178	3384
	Subtotal	0	0	202	4173
Long Term	Clearcut/Coppice	0	0	69	1190
	Overstory Removal	0	0	19	232
	Restoration Thinning	0	0	12	185
	Salvage/Sanitation	0	0	9	227
	Shelterwood	0	0	26	403
	Subtotal	0	0	135	2237
Total Canopy Effect		0	0	337	6410

Table 3. Comparison of proposed treatments (acres) and resultant soil disturbance (acres), abbreviated SD, by alternative, where N is the number of stands. Timber harvesting activities result in 13% soil disturbance,

mechanical site preparation activities result in 63% soil disturbance, and prescribed burning activities result in 100% soil. The activity with the higher soil disturbance was utilized if multiple activities were proposed.

				Alternative 1			Alternative 2		
Treatment		Secondary	SD (%)	N	Area (acres)	SD (acres)	N	Area (acres)	SD (acres)
Treatments with No Seasonal Restrictions	Clearcut/ Coppice	None	13%	0	0	0	2	101	13
		ASP	13%	0	0	0	47	842	109
		Burn	100%	0	0	0	2	10	10
		MSP	63%	0	0	0	9	96	60
		MSP-Burn	100%	0	0	0	2	18	18
	Improvement	None	13%	0	0	0	4	146	19
		Burn	100%	0	0	0	1	17	17
	None	Burn	100%	0	0	0	5	3	2.7
	Overstory Removal	None	13%	0	0	0	14	148	19
	Precommercial Thinning	None	13%	0	0	0	2	25	3
		MSP	63%	0	0	0	1	38	24
	Restoration Thinning	MSP	63%	0	0	0	10	176	111
		MSP-Burn	100%	0	0	0	2	9	9
	Salvage/ Sanitation	None	13%	0	0	0	8	205	27
	Selection	Argonne	13%	0	0	0	12	118	15
		Canopy Gaps	13%	0	0	0	118	3225	419
	Shelterwood	None	13%	0	0	0	2	44	6
		Burn	100%	0	0	0	4	46	46
		MSP	63%	0	0	0	16	259	163
		MSP-Burn	100%	0	0	0	3	49	49
	Thinning	None	13%	0	0	0	156	3015	392
		Burn	100%	0	0	0	1	6	6
		MSP	63%	0	0	0	1	20	12
Subtotal				0	0	0	422	0	1551
Winter Only Treatments	Clearcut/ Coppice	ASP	13%	0	0	0	7	123	0
	Improvement	None	13%	0	0	0	3	100	0
	Overstory Removal	None	13%	0	0	0	5	83	0
	Precommercial Thinning	None	13%	0	0	0	1	29	0
	Salvage/ Sanitation	None	13%	0	0	0	1	22	0
	Selection	Argonne	13%	0	0	0	4	408	0
		Canopy Gaps	13%	0	0	0	46	1966	0
	Shelterwood	MSP	63%	0	0	0	1	5	0
	Thinning	None	13%	0	0	0	20	343	0
Subtotal				0	0	0	88	3080	0
Total				0	0	0	510	11695	1551

Table 4. Comparison of proposed road activities (miles) and resultant soil disturbance (acres), abbreviated SD, by alternative, where N is the number of road segments. The area of soil disturbance is 2.42 acres/mile (20 feet x 5,280 feet/mile ÷ 43,560 feet²/acre) for road construction, 0.97 acres/mile (8 feet x 5,280 feet/mile ÷ 43,560 feet²/acre) for road reconstruction, and 0.07 acres/road segment (N) (200 feet X 16 feet ÷ 43,560 feet²/acre) for closing and road decommission. Reconstruction of open NFS roads will occur within the existing road footprint and are assumed not to have any soil disturbance. Decommissioning of currently closed roads will not require any ground disturbing activities and will not result in any soil disturbance.

Action	Road Classification	Alternative 1			Alternative 2		
		N	Length (miles)	SD (acres)	N	Length (miles)	SD (acres)
Construction	New-Close After	0	0.0	0	4	1.2	3
	Temporary Road-Close After	0	0.0	0	1	0.2	0
	Subtotal	0	0.0	0	5	1.4	3
Reconstruction	Open NFS Road	0	0.0	0	6	10.6	0
	Undetermined-Close After	0	0.0	0	10 5	35.8	35
	Subtotal	0	0.0	0	11 1	46.4	35
Decommission	Closed NFS Road	0	0.0	0	10	5.8	0
	Open NFS Road	0	0.0	0	2	0.3	0
	Undetermined	0	0.0	0	64 7	141.1	48
	Subtotal	0	0.0	0	65 9	147.2	48
Convert To Trail	Closed NFS Road	0	0.0	0	5	2.4	0
	Open NFS Road	0	0.0	0	7	3.1	0
	Undetermined	0	0.0	0	12 9	43.4	0
	Subtotal	0	0.0	0	14 1	48.9	0
Open	Undetermined	0	0.0	0	2	0.9	0
	Subtotal	0	0.0	0	2	0.9	0
Close	Open NFS Road	0	0.0	0	3	1.0	0
	Undetermined	0	0.0	0	37	14.9	3
	Subtotal	0	0.0	0	40	15.9	3
Total		0	0.0	0	95 8	260.8	89

2.1 Alternative 1 (No Action)

2.1.1 Direct and Indirect effects

There would be no activities and therefore no direct or indirect effects that would change the existing condition. NNIP would continue to persist at their current rates and may increase through natural means of spread (animals, wind, water) or by human vectors (vehicles, ATV/ORVs, road maintenance, etc.), but not as a direct or indirect result of the no-action alternative. However, since road decommissioning would not occur under this alternative, as they would under Alternatives 2, vehicle use on 147.2 miles of road would not be eliminated (see Table 4).

2.1.2 Cumulative effects

Since there would be no direct or indirect effects from Forest Service actions that could contribute to NNIP spread or introduction there would be no cumulative effects. Ongoing actions such as annual road maintenance (mowing, grading, etc.) or vegetation management within the project area from previous decision documents would still have the potential to have an effect on NNIP. It should be noted that almost all infestations within the project area are eligible for treatment under previous NNIP control decisions (USDA Forest Service, 2005).

2.2 Alternative 2

2.2.1 Direct Effects

Table 5. Comparison of the number (N) and area (acres) of stands infested by NNIP, of stands infested by NNIP and within ¼ mile of other NNIP infestations and un-infested stands within ¼ mile of NNIP infestations for Alternative 2 in the Fourmile project area by proposed treatment, including winter only restrictions.

			Infested Stands		Infested Stands ≤ ¼ mile from other Infestation(s)		Uninfested Stands ≤ ¼ mile from Infestation(s)	
Treatment		Secondary	N	Area (acres)	N	Area (acres)	N	Area (acres)
Treatments with No Seasonal Restrictions	Clearcut/ Coppice	None	-	-	1	99	1	2
		ASP	1	1	8	341	30	403
		Burn	-	-	-	-	2	10
		MSP	-	-	5	68	4	28
		MSP-Burn	-	-	-	-	2	18
	Improvement	None					4	146
		Burn					1	17
	None	MSP-Burn	-	-	-	-	1	1
	Overstory Removal	None	-	-	2	27	7	101
	Precommercial Thinning	None	-	-	1	10	-	-
		MSP	-	-	1	38	-	-
	Restoration Thin	MSP-Burn	1	8	1	81	7	64
	Salvage/ Sanitation	None	1	33	4	154	2	13
	Selection	Argonne			3	30	6	59
		Canopy Gaps	2	108	38	1508	59	1236
	Shelterwood	None	-	-	1	42	1	2
		Burn	1	6	-	-	2	15
		MSP	-	-	4	83	10	116
		MSP-Burn	-	-	-	-	3	49
	Thinning	None	14	167	50	1628	67	1005
		Burn	-	-	-	-	1	6
		MSP	1	20	-	-	-	-
Total			21	343	119	4108	210	3289
Winter	Clearcut/ Coppice	ASP	-	-	-	-	2	16
	Improvement	None	-	-	-	-	2	70
	Overstory Removal	None	-	-	-	-	5	83
	Precommercial Thinning	None	-	-	-	-	1	29
	Salvage/ Sanitation	None	-	-	-	-	1	22
	Selection	Argonne	1	39	3	369	-	-
		Canopy Gaps	2	127	19	1059	16	578
	Thinning	None			8	244	4	25
	Total			3	166	30	1672	31

Direct effects are defined as the risk of expansion and dispersal of current NNIP infestations within the project area as a result of project activities. And will be measured by the proximity of known infestations (within ¼ mile) to proposed activities and the amount of travel through known infestations.

There are a total of 173 stands totaling 6,290 acres (53.8% of proposed stands) in Alternative 2 infested with NNIP (see Table 5). There may be several occurrences of a single species or multiple species within a stand, see Appendix B and C for infestations within stands and stands within ¼ mile of infestations. Excluding the stands with winter only harvest restrictions, there are 140 stands totaling 4,452 acres (38.1% of proposed stands) that have an elevated risk of NNIP spread due to potential movement of logging equipment and machinery through NNIP infestations. There are an additional 241 stands totaling 4,112 acres (35.2% of proposed stands) proposed for treatment in Alternative 2 within ¼ mile of known NNIP infestations (see Table 5). Excluding the stands with winter only harvest restrictions, there are 210 stands totaling 3,289 acres (28.1% of proposed stands) that have an elevated risk of NNIP introduction from propagule transport by logging equipment or machinery from nearby infested stands or from infestations along road corridors. There are a total of 416.9 miles of existing roads in the Fourmile project area. The potential for introduction and establishment of NNIP propagules is significant on any open road. The Fourmile project proposes to build 1.4 miles of new roads, which will be closed following project implementation. In addition, 147.2 miles of existing roads are proposed to be decommissioned reducing the net mileage of roads in the project area by 145.8 miles. Decommissioned roads are permanently removed from the transportation system and are allowed to return normal ecological functions. Decommissioning efforts may include reestablishing drainage patterns, scarifying roadbeds, planting native vegetation, re-contouring back to pre-road status, or may be as little as placing an earthen berm and allowing to revegetate naturally. Closed roads are removed from the motor vehicle use map (MVUM), but retained for intermittent access for management activities. Not all roads proposed for closure will be physically closed. Infestations on roads proposed for decommissioning and those on closed roads that are physically closed would be slower to spread to adjacent roads due to the lack of vehicle traffic.

Table 6. Comparison of the number of roads (N), associated length (miles) and resultant soil disturbance (acres), abbreviated SD, with NNIP infestations and within ¼ mile of NNIP infestations by proposed road activity of Alternatives 2 in the Fourmile project area by proposed action.

Action	Road Classification	Roads with Infestation(s)			Roads ≤ ¼ mile from Infestation(s)		
		N	Length (miles)	SD (acres)	N	Length (miles)	SD (acres)
Construction	New-Close After	-	-	-	3	0.8	2
	Temporary Road	-	-	-	1	1.0	2
	Subtotal	0	0.0	0	4	1.8	4
Reconstruction	Unauthorized-Close After	25	7.0	7	54	19.6	19
	Subtotal	25	7.0	7	54	19.6	19
Decommission	Closed NFS Road	3	1.0	0	5	3.3	0
	Open NFS Road	1	0.2	0	-	-	-
	Unauthorized	129	31.6	9	356	76.2	26
	Subtotal	133	32.8	10	361	79.5	26
Close	Open NFS Road	2	0.7	0	1	0.3	0
	Unauthorized	15	5.4	1	15	6.8	1
	Subtotal	17	6.1	1	16	7.1	1
Total		175	45.9	18	435	108.0	51

As seen in Table 6, there are 45.9 miles of proposed road actions in the project area that contain or are adjacent to an NNIP infestation. These roads have an elevated risk of NNIP spread due to potential movement of machinery through NNIP infestations. There are an additional 108.0 miles of proposed road actions in the project area that are within ¼ mile of known NNIP infestations. These roads have an elevated risk of NNIP introduction from propagule transport by machinery from nearby infested road corridors.

To avoid transporting NNIP propagules, machinery and equipment must be clean when entering non-infested areas. Machinery and equipment will avoid travel through documented NNIP infestations during implementation. Depending on the species and extent of an infestation, infestations may be flagged.

Exceptions may be made in extraordinary circumstances, such as when an NNIP infestation may be so severe that it may encompass an entire stand or travel route in an area required for project implementation. These scenarios will be evaluated by the District Botanist/Ecologist on a case by case basis. However, moving machinery and equipment that has operated in an infested area to an un-infested area is prohibited; the equipment must be cleaned before moving to NNIP free area.

2.2.2 Indirect Effects

Indirect effects are defined as the likelihood that habitat becomes more suitable for the establishment and/or persistence of NNIP as a result of project actions. And will be measured by effects of proposed activities on habitat suitability, the area of altered canopy closure, and the area of soil disturbance.

As seen in Table 2, Alternative 2 proposes to treat 5,285 acres in 173 stands that would have a negligible canopy effect, 4,173 acres in 202 stands that would have a short-term canopy effect (\leq five years), and 2,237 acres in 135 stands that would have a long-term canopy effect (\geq 50 years). Negligible canopy effects result in a slight risk of establishment and persistence of shade intolerant species and sustained risk of establishment, persistence, and spread of shade tolerant species. Short-term canopy reductions result in increased risk of establishment and persistence of shade intolerant, shade tolerant, and habitat generalist species. Long-term canopy reductions result in a high risk of establishment and persistence of shade intolerant species. As stands recover and canopy closure approaches 80%, established shade intolerant NNIP will recede and the risk of establishment, persistence, and spread diminishes.

As seen in Table 3, proposed treatments in Alternative 2 would result in 1551 acres of soil disturbance. An additional 89 acres of soil disturbance would result from proposed road activities in Alternative 2, as seen in Table 4. The total soil disturbance caused by proposed treatments and road activities in Alternative 2 is 1,640 acres, which is approximately 3.7% of all NFS lands in the Fourmile project area (see Table 9). The risk of establishment, persistence, and spread of NNIP will be increased in these areas. Implementation of project design features would reduce some of the risk of NNIP introduction, establishment, persistence and spread.

2.2.3 Cumulative Effects

Cumulative effects are the changes to the environment caused by the incremental impact of the proposed action when added to past, present, or reasonably foreseeable future actions. It should be noted that while the cumulative effects analysis considers sources of NNIP on other ownerships, specific information on land management activities that result in soil disturbance that may contribute to the spread of NNIP on private, county or state lands is unknown. Thus, calculating acres of soil disturbance is limited to the National Forest System (NFS) lands. The analysis area for cumulative effects is the ER-FL RD and includes several other vegetation management projects on the district, relative to the Fourmile project.

As seen in Tables 7 and 8, no projects have been completed within the Fourmile project area within the past five years and there are no current projects within the Fourmile project area. There are two large vegetation management projects, Early Successional habitat Improvement (ESHI) and Polecat Pine, which are ongoing in the Fourmile Project area. Since both of the aforementioned vegetation management projects are partially implemented and there are additional activities planned in the future, the entire project was included in reasonably foreseeable.

Table 7. Summary of past, present, and reasonably foreseeable vegetation management activities within the Fourmile project area and the ER-FL RD and their associated soil disturbance, abbreviated SD. The year of project completion, actual or estimated, is in parentheses. If a project has not been completed in its entirety (only partially implemented in the past or currently) then the entire project was included in reasonably foreseeable. Acres are the unit of measure for all fields.

Project	Harvest	Site Preparation	Winter Only	Canopy Impacts	SD
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Fourmile Project Area					
Past					
None	0	0	0	0	0
Present					
None	0	0	0	0	0
Reasonably Forseeable					
E.S.H.I (2024)	325	62	0	325	73
Fourmile (2023)	11695	570	3080	6410	1551
Polecat Pine (2020)	655	0	168	655	63
Eagle River-Florence Ranger District					
Past					
Grandma Lk. Salvage (2017)	227	0	0	227	30
Mr Burns Salvage (2013)	237	17	23	237	36
N. Reservoir Salvage (2017)	232	0	0	232	30
Present					
None	0.0	0.0	0.0	0.0	0
Reasonably Forseeable					
E.S.H.I (2024)	750	62	0	750	129
Fishel (2019)	5517	58	0	1776	717
Fourmile (2023)	11695	570	3080	6410	1551
Grub Hoe (2019)	3326	31	2835	582	84
Long Rail (2017)	8439	159	3290	2164	769
Morgan Lake (2021)	8416	203	1423	4829	899
Northwest Howell (2021)	7191	401	4383	1250	566
Phelps (2020)	8433	238	667	853	1129
Polecat Pine (2020)	4295	0	836	4295	450

As seen in Table 9, past and present projects have resulted in 0.0% and 0.3% change in soil disturbance for both Alternatives 1 and 2 across the Fourmile project area and ER-FL RD, respectively. When reasonably foreseeable projects, including the proposed activities in the Fourmile project, are accounted for, soil disturbance across the Fourmile project area increases to 0.3 % and 4.0% for Alternatives 1 and 2, respectively, and 1.6%, and 2.1% across the ER-FL RD for Alternatives 1 and 2, respectively. When compared to Alternative 1, Alternative 2 results in 3.7% and 0.5% more cumulative soil disturbance in the Fourmile project area and ER-FL RD, respectively.

Past and present projects have resulted in 0.0% and 1.0% change to light availability for both Alternatives 1 and 2 across the Fourmile project area and ER-FL RD, respectively. When reasonably foreseeable projects, including the proposed activities in the Fourmile project, are accounted for, total light availability across the Fourmile project area increases to 2.2% and 16.8% for Alternatives 1 and 2, respectively, and 5.6%, and 7.6% across the ER-FL RD for Alternatives 1 and 2, respectively. Cumulative light availability as a result of the proposed activities in Alternative 2 increased by 14.6% in the Fourmile project area and 2.0% in the ER-FL RD when compared to Alternative 1. Light availability effects can be expected to last until canopy closure rebounds to 80% in five to 50 years, depending on proposed harvest method.

Table 8. Summary of past, present, and reasonably foreseeable transportation management activities within the Fourmile project area and the ER-FL RD and the associated soil disturbance (acres), abbreviated SD. The year of project completion, actual or estimated, is in parentheses. If a project has not been completed in its entirety (only partially implemented in the past or currently) then the entire project was included in reasonably foreseeable. All units are miles, except where noted.

Project	Const.	Temp Const.	Reconst.	Decom.	Closed	Road Change	SD (acres)
Fourmile Project Area							
Past							
None	0.0	0.0	0.0	0.0	0.0	0.0	0
Present							
None	0.0	0.0	0.0	0.0	0.0	0.0	0
Reasonably Forseeable							
E.S.H.I (2024)	0.0	1.4	0.0	0.0	0.0	0.0	5
Fourmile (2023)	1.2	0.2	41.3	147.2	15.9	-145.8	89
Polecat Pine (2018)	0.0	0.0	0.0	0.0	0.0	0.0	0
Eagle River-Florence Ranger District							
Past							
Grandma Lk. Salvage (2016)	0.0	0.5	0.0	0.0	0.0	0.0	1
Mr Burns Salvage (2013)	0.0	0.0	0.0	0.0	0.0	0.0	0
N. Reservoir Salvage (2017)	0.0	0.5	0.0	0.0	0.0	0.0	1
Present							
None	0.0	0.0	0.0	0.0	0.0	0.0	0
Reasonably Forseeable							
E.S.H.I (2024)	0.0	2.7	0.0	0.0	0.0	0.0	9
Fishel (2019)	1.5	0.0	22.3	44.6	11.2	-54.3	2
Fourmile (2023)	1.2	0.2	41.3	147.2	15.9	-145.8	89
Grub Hoe (2019)	0.0	1.4	3.9	20.2	2.5	-22.7	46
Long Rail (2017)	0.0	3.3	43.1	47.0	2.1	-45.8	5
Morgan Lake (2021)	3.9	0.3	29.7	32.8	3.4	-28.8	30
Northwest Howell (2019)	2.0	0.0	24.0	18.0	0.0	-16.0	3
Phelps (2020)	0.0	0.8	12.0	30.8	6.1	-36.9	102
Polecat Pine (2018)	0.0	0.1	0.0	0.0	0.0	0.0	0

Most projects across the ER-FL RD maintain or reduce total road miles. Past and present projects have resulted in 0.0% and -1.7% road change for both Alternatives 1 and 2 across the Fourmile project area and ER-FL RD, respectively. When reasonably foreseeable projects, including the proposed activities in the Fourmile project, are accounted for, road change across the Fourmile project area is 0.0% and -35.0% for Alternatives 1 and 2, respectively, and -7.8%, and 13.3% across the ER-FL RD for Alternatives 1 and 2, respectively. Cumulative road change as a result of the proposed activities in Alternative 2 is reduced by 35.0% in the Fourmile project area and 5.5% in the ER-FL RD when compared to Alternative 1. It is assumed that the net reduction in roads would halt motorized traffic, reducing the risk of NNIP spread by vehicle vectors, however the risk spread via other vectors such as wind, water and animals would remain.

Table 9. Cumulative effects comparison of past, present, and reasonably foreseeable vegetation management and transportation activities on soil disturbance (acres), light availability (acres), and net road change (miles) between alternatives of the Fourmile project. Reasonably foreseeable and total values include proposed Fourmile activities. Percentages are in relation to the total area (acres) or total road length (miles) at that particular scale.

		Alternative 1		Alternative 2	
Fourmile Project Area (44,078 acres; 416.9 miles)					
Soil Disturbance (acres)	Past	0	0.0%	0	0.0%

	Present	0	0.0%	0	0.0%
	Reasonably Foreseeable	142	0.3%	1,781	4.0%
	Total	142	0.3%	1,781	4.0%
Light Availability (acres)	Past	0	0.0%	0	0.0%
	Present	0	0.0%	0	0.0%
	Reasonably Foreseeable	980	2.2%	7,390	16.8%
	Total	980	2.2%	7,390	16.8%
Net Road Change (miles)	Past	0	0.0%	0	0.0%
	Present	0	0.0%	0	0.0%
	Reasonably Foreseeable	0	0.0%	-146	-35.0%
	Total	0	0.0%	-146	-35.0%
Eagle River Florence Ranger District (316,973 acres; 2,627.7 miles)					
Soil Disturbance (acres)	Past	873	0.3%	873	0.3%
	Present	0	0.0%	0	0.0%
	Reasonably Foreseeable	4,167	1.3%	5,806	1.8%
	Total	5,040	1.6%	6,679	2.1%
Light Availability (acres)	Past	3,313	1.0%	3,313	1.0%
	Present	0	0.0%	0	0.0%
	Reasonably Foreseeable	14,335	4.5%	20,745	6.5%
	Total	17,648	5.6%	24,058	7.6%
Net Road Change (miles)	Past	-46	-1.7%	-46	-1.7%
	Present	0	0.0%	0	0.0%
	Reasonably Foreseeable	-159	-6.0%	-305	-11.6%
	Total	-205	-7.8%	-350	-13.3%

3.0 Project Design Feature

Known non-native invasive plant infestations will be avoided during implementation. Exceptions may be made on a case by case basis and will be evaluated by the District Botanist/Ecologist.

Activities which could disturb known garlic mustard (*Alliaria petiolata*) infestations should only occur during frozen ground conditions.

Undocumented non-native invasive plant infestations not identified during the Fourmile analyses should be reported to the District Botanist/Ecologist for future treatment.

Insure, to the extent practicable, that road fill and gravel sources do not contain NNIP. If NNIP free fill and gravel sources are not available, scrape the top layer off of the fill/gravel source and use the fill/gravel underneath.

4.0 Monitoring and Treatment

Implementation of a monitoring and treatment plan for NNIP infestations would help reduce the potential impact of project activities on NNIP, however, neither has been included in the Fourmile project proposal, nor is it required by the Forest Plan. Furthermore, the determination of project effects on NNIP is not dependent on the implementation of a monitoring and treatment plan.

The use of Knutsen-Vandenberg (KV) funds may be available to accomplish treatment of infestations within the harvest area after sale units are sold. However, if funding (KV or other funding) is not available, treatment most likely would not occur. Appendix D lists all currently known NNIP infestations within the Fourmile project area that could receive KV funds for control treatments.

5.0 Conclusion

There are 140 stands totaling 4,452 acres (38.1% of proposed stands) proposed for treatment in Alternative 2 that contain documented NNIP infestations and have an elevated risk of NNIP spread. An additional 210 stands totaling 3,289 acres (28.1% of proposed stands) proposed for treatment in Alternative 2 are within ¼ mile of documented NNIP infestations and have an elevated risk of NNIP introduction. There are 45.9 miles of proposed road actions in Alternative 2 that contain or are adjacent to documented NNIP infestations that have an elevated risk of NNIP spread. An additional 108.0 miles of proposed road actions are within ¼ mile of documented NNIP infestations and have an elevated risk of NNIP introduction. Alternative 2 proposes a net reduction of roads in the Fourmile project area by 145.8 miles, reducing the risk of NNIP spread by vehicle vectors.

Alternative 2 proposes to treat 5,285 acres in 173 stands that would have a negligible canopy effect, resulting in a slight risk of establishment and persistence of shade intolerant NNIP. 4,173 acres in 202 stands are proposed for treatment that would have a short-term canopy effect (\leq five years), resulting in an increased risk of establishment and persistence of both shade tolerant and intolerant NNIP. And 2,237 acres in 135 stands are proposed for treatment that would have a long-term canopy effect (\geq 50 years) resulting in a high risk of establishment and persistence of shade intolerant NNIP. The total soil disturbance caused by proposed treatments (1,551 acres) and road activities (89 acres) in Alternative 2 is 1,640 acres, which is approximately 3.7% of all NFS lands in the Fourmile project area. The risk of establishment, persistence, and spread of NNIP will be increased in these areas.

Alternative 2 results in 3.7% more cumulative soil disturbance in the Fourmile project area and 0.5% more total soil disturbance in the ER-FL RD when compared to Alternative 1. The cumulative light availability as a result of the proposed activities in Alternative 2 increases by 14.6% in Fourmile project area and 2.0% in the ER-FL RD when compared to Alternative 1. Light availability effects can be expected to last until canopy closure rebounds to 80% in five to 50 years. Cumulative road change as a result of the proposed activities in Alternative 2 is reduced by 35.0% in Fourmile project area and 5.5% in the ER-FL RD when compared to Alternative 1. It is assumed that the net reduction in roads would halt motorized traffic, reducing the risk of NNIP spread by vehicle vectors. The effects of implementing Alternative 2 when added to the effects of past, present, and reasonably foreseeable actions are not expected to result in appreciable adverse cumulative effects relative to NNIP.

A contractual equipment cleaning clause would be adopted during Fourmile project implementation reducing the risk of NNIP propagule transport. Documented NNIP infestations will also be avoided during project implementation. Exceptions may be made on a case by case basis and will be evaluated by the District Botanist/Ecologist. All stands proposed for harvest in the Fourmile project area infested with garlic mustard (*Alliaria petiolata*) or stands that require travel through garlic mustard infestations for implementation, will be a winter only harvests to reduce the risk of introduction and spread.

Without implementation of project design features, Alternative 2 would directly and indirectly increase the risk of spread and/or introduction of NNIP. The design features reduce the actual potential for NNIP spread, introduction, establishment, and persistence as a result of project actions. Therefore, it is not anticipated that the threshold of spreading known infestations due to proposed actions would be exceeded, nor will the project exceed a low risk of new introductions due to the proposed actions. With the implementation of design features specifically to minimize spread and introduction of NNIP, Alternative 2 is consistent with Forest Plan Standards and Guidelines.

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Appendix A

CNNF NNIP list and species considered, present and analyzed within the Fourmile Project Area.

Species	Common Name	CNNF	WI NR 40	I-rank	Habitat	Present	Analyzed
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**Fourmile Vegetation
Management Project**

<i>Aegopodium podagraria</i>	bishop's goutweed	A	R	Low	Open forests, forest edges, fields, pastures, residences & disturbed areas	Y	Y
<i>Alliaria petiolata</i>	garlic mustard	A	R	High-Medium	Shaded upland forests, floodplains, disturbed areas, yards, trails & roadsides	Y	Y
<i>Anthriscus sylvestris</i>	wild chervil	A	R/P	Not Ranked	Roadsides, open woods, fields & pastures	N	N
<i>Berberis thunbergii</i>	Japanese barberry	A	R*	High-Medium	Open to shaded forests, wetlands, old fields & disturbed areas.	Y	Y
<i>Caragana arborescens</i>	Siberian peashrub	A	R*	High-Low	Coniferous and hardwood forests, forest edges, savannas, trails & roadsides	N	N
<i>Celastrus orbiculata</i>	Oriental bittersweet	A	R	High-Medium	Open to shaded forests, woodlands, fields, hedgerows & coastal areas	N	N
<i>Centaurea stoebe</i>	spotted knapweed	A	R	High-Medium	Open & dry areas; prairies, barrens, dunes, forest openings, fields, pastures, roadsides, disturbed areas & waste areas	Y	Y
<i>Cirsium arvense</i>	Canada thistle	A	R	High-Medium	Prairies, savannas, glades, dunes, streambanks, sedge meadows, forest openings, croplands, pastures, lawns, gardens, roadsides, ditches, and waste areas	Y	Y
<i>Cirsium palustre</i>	European marsh thistle	A	R/P	Medium-Low	Moist, semi shaded roadsides, old fields, wetlands, forest edges, beaches & dunes.	Y	Y
<i>Cirsium vulgare</i>	bull thistle	A	N	Medium-Low	Forests, forest edges, forest clearcuts, rangelands, pastures, fields, fencerows, ditches, roadsides, disturbed areas and waste sites	Y	Y
<i>Elaeagnus umbellata</i>	autumn olive	A	R	High	Open forests, roadsides & agricultural fields	N	N
<i>Euphorbia cyparissias</i>	cypress spurge	A	R	Medium-Low	Dry grasslands, pastures, agricultural fields, disturbed areas & roadsides	N	N
<i>Euphorbia esula</i>	leafy spurge	A	R	High-Medium	Dry grasslands, pastures, agricultural fields, disturbed areas & roadsides	Y	Y
<i>Frangula alnus</i>	glossy buckthorn	A	R*	High-Medium	Open to shaded moist upland forests, bogs, fens, sedge meadows & forest edges	N	N
<i>Galeopsis tetrahit</i>	brittlestem hempnettle	A	R	Not Ranked	Shaded forests, open woods, roadsides, pastures, fields & disturbed areas	N	N
<i>Galium mollugo</i>	false baby's breath	A	R	Not Ranked	Grasslands, open woodlands, meadows, pastures, river banks, disturbed areas & roadside ditches	N	N
<i>Hesperis matronalis</i>	dames rocket	A	R	Medium-Low	Moist woodlands, woodland edges, roadsides & open areas.	N	N
<i>Iris pseudacorus</i>	paleyellow iris	A	R	High-Medium	Wetlands, forests, bogs, swamps, marshes, lakes, streams & ponds	N	N
<i>Knautia arvensis</i>	field scabiosa	A	R	Not Ranked	Prairies, grasslands, roadsides & disturbed areas	N	N

<i>Lonicera spp.</i>	exotic bush honeysuckles	A	R/P	Not Ranked	Forests, forest edges, open woods, fens, bogs, lakeshores, prairies, fields, pastures, open grasslands & roadsides.	Y	Y
<i>Lysimachia nummularia</i>	creeping jenny	A	R*	Medium-Low	Moist forests, woodland edges, floodplain forests, swamps, wet meadows, fens, stream borders, lawns, roadside ditches, & grasslands	N	N
<i>Lythrum salicaria</i>	purple loosestrife	A	R	High	Shallow wetlands, waterbody edges, roadside ditches & wet disturbed areas	N	N
<i>Myosotis scorpioides</i>	true forget-me-not	A	R	Not Ranked	Wetlands, moist forests, bogs, swamps, marshes, lakes, streams & ponds	N	N
<i>Myosotis sylvatica</i>	woodland forget-me-not	A	R	Not Ranked	Shaded to semi-shaded moist forests	Y	N
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	A	R	High	Heavily used and disturbed rivers, lakes & waterbodies	N	N
<i>Pastinaca sativa</i>	wild parsnip	A	R*	Low-Insignificant	Open forest edges, prairies, oak savannas, fens, old fields, pastures, roadsides & disturbed areas	N	N
<i>Phalaris arundinacea</i>	reed canarygrass	A	R*	High	Open wetlands, riparian areas, floodplains, fens, marshes, meadows & prairies	Y	Y
<i>Phragmites australis</i>	common reed	A	R/P	High	Open lake shores, river banks and roadways & disturbed areas	N	N
<i>Pimpinella saxifraga</i>	solidstem burnet saxifrage	A	R	Not Ranked	Dry, well drained grasslands and woodlands	N	N
<i>Polygonum cuspidatum</i>	Japanese knotweed	A	R	High-Medium	Lakeshores & riparian areas	N	N
<i>Potamogeton crispus</i>	curly pondweed	A	R	Medium	Heavily used and disturbed lakes, rivers & waterbodies	N	N
<i>Rhamnus cathartica</i>	common buckthorn	A	R	High-Medium	Well drained oak forests, riparian woods, savannas, prairies, old fields & roadsides	N	N
<i>Robinia hispida</i>	bristly locust	A	R	Not Ranked	Upland forests, forest edges, prairies, forested dunes, grasslands, fencerows, roadsides & disturbed areas	N	N
<i>Robinia pseudoacacia</i>	black locust	A	R	High-Medium	Forests, upland prairies, savannas, pastures, old fields, fencerows & roadsides	N	N
<i>Securigera varia</i>	crownvetch	A	R	High	Open to shaded prairies, grasslands, dunes, floodplains, forest edges, gravel bars in waterways, agricultural lands & roadsides	N	N
<i>Tanacetum vulgare</i>	common tansy	A	R*	Low	Well drained & open disturbed areas, roadsides, fields, prairies, pastures & hedgerows	Y	Y
<i>Torilis japonica</i>	erect hedgeparsley	A	R/P	Not Ranked	Forests, grasslands, hedgerows & roadsides	N	N

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<i>Valeriana officinalis</i>	garden valerian	A	R	Low	Upland forests, wetlands, marshes, woodland swamps, grasslands & stream edges.	Y	N
<i>Verbascum thapsus</i>	common mullein	A	N	Medium	Coniferous and hardwood forests, meadows, prairies, pastures, old fields, roadsides, disturbed areas & waste sites	Y	N
<i>Arctium minus</i>	lesser burdock	B	N	Medium- Insignificant	Roadsides & disturbed areas	Y	N
<i>Dianthus barbatus</i>	sweetwilliam	B	N	Not Ranked	Open to semi shaded forests woodland edges, meadows & riparian areas	N	N
<i>Hieracium aurantiacum</i>	orange hawkweed	B	N	Medium- Low	Open to semi shaded forests, plantations, riparian areas, moist meadows, pastures, fields, roadsides, disturbed areas & urban areas	P	N
<i>Hieracium caespitosum</i>	meadow hawkweed	B	N	Medium- Insignificant	Open to semi shaded forests, plantations, riparian areas, moist meadows, pastures, fields, roadsides, disturbed areas & urban areas	P	N
<i>Hypericum perforatum</i>	common St. Johnswort	B	N	High- Medium	Dry, open woods, dunes, rangelands, meadows, pastures, fields, roadsides, disturbed areas & waste sites	Y	N
<i>Lathyrus tuberosus</i>	tuberous sweetpea	B	N	Not Ranked	Woodland edges & hedgerows	N	N
<i>Linaria vulgaris</i>	butter and eggs	B	N	High-Low	Open forest edges, rangelands, prairies, meadows, pastures, agricultural fields, roadsides, disturbed areas & waste sites	P	N
<i>Melilotus officinalis</i>	sweetclover	B	N	Medium- Low	Prairies, savannas, dunes, fields & roadsides	N	N
<i>Vinca minor</i>	common periwinkle	B	N	Low	Moist forests, woodland edges, fields & roadsides	N	N
<i>Ailanthus altissima</i>	tree of heaven	C	R	Medium	Urban areas, fields, roadsides, fencerows, woodland edges & forest openings	N	N
<i>Ampelopsis brevipedunculata</i>	Amur peppervine	C	P	Medium/Low	Moist woods, floodplains, stream banks & woodland edges.	N	N
<i>Butomus umbellatus</i>	flowering rush	C	R	Medium/Low	Marshes, backwaters & shorelines	N	N
<i>Campanula rapunculoides</i>	rampion bellflower	C	R	High-Low	Fields, stream banks, woodlands, prairies, roadsides, urban areas & oak savannas	N	N
<i>Carduus nutans</i>	nodding plumeless thistle	C	R	High-Low	Pastures, old fields, roadsides, waste areas, ditch banks & prairies	N	N
<i>Centaurea spp.</i>	knapweed	C	R/P	Not Ranked	Open & dry areas; prairies, barrens, dunes, forest openings, fields, pastures, roadsides, disturbed areas & waste areas	N	N

<i>Cynanchum louiseae</i>	Louise's swallow-wort	C	R/P	High	Open to shaded forests, woodland edges, grasslands & old fields	N	N
<i>Cynanchum rossicum</i>	European swallow-wort	C	P	High-Medium	Open to shaded forests, woodland edges, grasslands & old fields	N	N
<i>Cynoglossum officinale</i>	gypsyflower	C	R	Medium-Low	Pastures, roadsides, grasslands, riparian areas & meadows	N	N
<i>Dipsacus fullonum</i>	Fuller's teasel	C	R	Medium-Low	Open areas, prairies, savannas, sedge meadows, roadsides & disturbed areas	N	N
<i>Dipsacus laciniatus</i>	cutleaf teasel	C	R	Medium/Low	Open areas, prairies, savannas, sedge meadows, roadsides & disturbed areas	N	N
<i>Elaeagnus angustifolia</i>	Russian Olive	C	R	High	Dry to moist open areas	N	N
<i>Heracleum mantegazzianum</i>	giant hogweed	C	P	Medium-Low	Semi shaded moist areas, streambanks, roadsides, empty lots & woodland edges	N	N
<i>Humulus japonicus</i>	Japanese Hop	C	R/P	Medium-Low	Floodplains, stream banks & lakeshores	N	N
<i>Linaria dalmatica</i>	Dalmatian toadflax	C	R/P	Not Ranked	Open pastures, rangelands, agricultural fields, prairies, clear cut forests & disturbed areas.	N	N
<i>Microstegium vimineum</i>	Nepalese browntop	C	P	High-Medium	Wetlands, streambanks, ditches, mesic forests & floodplains	N	N
<i>Polygonum sachalinense</i>	giant knotweed	C	P	High-Medium	Lakeshores, riparian areas, floodplain forests, disturbed areas, roadsides & vacant lots	N	N
<i>Populus alba</i>	white poplar	C	R	High-Low	Open fields, forest edges & wetland fringes	N	N
<i>Rosa multiflora</i>	multiflora Rose	C	R	Medium-Low	Open to semi shaded woodlands, forest edges, old fields, roadsides, savannas & prairies	N	N
<i>Typha angustifolia</i>	narrowleaf cattail	C	R	High-Medium	Marshes, wet meadows, fens, roadsides, ditches, shallow ponds, streams & lake shores	N	N

CNNF Non Native Invasive Plant List (Created August 2000, last updated August 2015)

A: Species of immediate concern. These species are documented on the CNNF (or within proclamation boundary) and are currently invading native plant communities. Includes those WI DNR NR-40-listed plants that have been found on CNNF as of 2015. Control is warranted; for some species initiating control depends on location.

B: Species known to be invasive and present within the CNNF; invasion in natural communities is uncertain. Record and map all sites, monitor, control under certain circumstances such as high priority sites. These species are not listed by WI DNR NR-40. This list will change as new species are discovered.

C: Species to watch for. Species known to be ecologically invasive, but are not yet documented on the CNNF. If found on the CNNF they need to be documented and mapped. If detected they will likely be added to the "A List".

Wisconsin Chapter NR 40 Invasive Species List (Created September 1, 2009, last updated May 1, 2015)

P: Prohibited-Not yet in the state or only in a few places. Likely to cause environmental and/or economic harm. Eradication and prevention is feasible. Cannot transport, possess, transfer, or introduce without a permit. Control is required. DNR may order or conduct a control effort.

R: Restricted-Already widely established in the state. High environmental and/or economic impacts are evident with these species. Complete eradication is unlikely. Cannot transport, transfer, or introduce without a permit. Possession is allowed except. Control is encouraged but not required.

R*: Restricted with Exceptions-Restriction only applies to certain types, cultivars, varieties, or hybrids of a species. See the Wisconsin Chapter NR 40 Invasive Species List for details

R/P: Restricted/Prohibited-Restricted in certain counties and prohibited elsewhere. Restricted counties vary by species; see the Wisconsin Chapter NR 40 Invasive Species List for details

N: Non-Restricted-species that may have some beneficial uses as well as negative impacts on the environment but are already integrated into Wisconsin's ecosystems so that control or eradication is not practical or feasible. Not proposed to be regulated at this time.

NatureServe Invasive Species Impact Rank (developed May 2004, updated on an interim basis)

High: Species represents a severe threat to native species and ecological communities

Medium: Species represents moderate threat to native species and ecological communities

Low: Species represents a significant but relatively low threat to native species and ecological communities

Insignificant: Species represents an insignificant threat to native species and ecological communities

Not Ranked: Not yet ranked

Fourmile Project Area Status (Present)

Y: Present within project area

N: Not present within project area

P: Not recorded within project area, however occurrence is probable.

Appendix B

Stand area (ac) of stands proposed for treatment in Alternatives 2 that are infested with NNIP and the gross area (as) of those infestations in the Fourmile project area by species. NNIP infestations have been differentiated by their location into along or adjacent to roads and within the interior of the stand.

Stand ID	Area	Proposed	Along/Adjacent to Roads/Routes								Stand Interior					
			ALPE4	CEBI2	CIAR4	CIPA6	CIVU	EUES	PHAR3	TAVU	ALPE4	CEBI2	CIAR4	CIPA6	CIVU	LONIC

09130302001001	16	Partial Overstory Removal		2.1			2.1									
09130302001003	20	Thin-MSP		5.9			0.9			0.2						
09130302001004	9	Thin		0.7						0.2						
09130302001006	38	PCT-MSP		0.1												
09130302001010	43	Thin			0.3											
09130302001030	144	Selection-Canopy Gaps				5.0	0.1									
09130302001032	114	Sanitation		0.1		1.3	0.5									
09130302001040	5	Selection-Canopy Gaps				1.1										
09130302001044	2	Thin		0.9												
09130302002001	42	Shelterwood		1.9		2.3	0.1		1.5	0.0						
09130302002002	9	Thin		2.2		0.3										
09130302002006	4	Thin				1.3										
09130302002008	6	Thin		0.0		1.0	0.0									
09130302002011	13	Thin				0.4			0.4							
09130302002012	206	Selection-Canopy Gaps				7.6			5.7							
09130302002013	3	Thin			0.0	0.5			0.5							
09130302002018	187	Thin				0.5										
09130302002021	107	Selection-Canopy Gaps				3.5	0.6		2.9							
09130302002025	7	Thin					0.2									
09130302002029	18	Selection-Canopy Gaps				2.8			0.9							
09130302003004	12	Thin				0.1										
09130302003006	11	Partial Overstory Removal			0.2	0.2			0.2				0.0			
09130302003008	56	Thin		0.1		6.3			5.1							
09130302007002	5	Selection-Canopy Gaps							2.5	0.1						
09130302007006	24	Thin					0.3		4.2							
09130302007007	5	Salvage			0.1											
09130302007009	12	Selection-Canopy Gaps							1.8							
09130302007025	15	Thin					0.4		2.7							
09130302007026	41	Thin							2.6							
09130302008002	99	Clearcut				0.5										
09130302008003	5	Thin				1.0										
09130302008004	4	Thin				0.5										
09130302008005	49	Selection-Canopy Gaps				0.2										
09130302011009	117	Thin	41.1			2.7			2.8				0.1		0.0	
09130302013012	38	Shelterwood-MSP				3.9	0.1		3.9							
09130302013017	9	Thin		0.1		2.5			2.5							
09130302014013	64	Selection-Canopy Gaps	2.5								0.0					
09130302014016	14	Thin	8.9													
09130302015001	108	Selection-Canopy Gaps	0.5				0.0				2.6					
09130302016003	29	Thin			0.3		0.7		3.5	3.5						

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09130302016004	9	Selection-Canopy Gaps		0.0					1.6	2.2						
09130302016006	13	Salvage			0.0											
09130302016008	130	Selection-Canopy Gaps											0.2			
09130302019003	240	Selection-Canopy Gaps	0.1			11.8							0.5			
09130302019004	11	Thin				0.2										
09130302019005	6	Coppice-ASP				0.3										
09130302019009	25	Selection-Canopy Gaps											0.3			
09130302020003	22	Salvage											0.3			
09130302177009	28	Selection-Canopy Gaps		1.0	0.0	4.4			4.4							
09130302177010	48	Thin		3.1		0.5			0.5							
09130302177021	15	Selection-Canopy Gaps										0.0				
09130302177030	6	Selection-Canopy Gaps			0.0						0.7					
09130302177044	17	Thin		0.1												
09130302178005	5	Selection-Canopy Gaps				1.4			1.4							
09130302178006	5	Selection-Canopy Gaps				1.8			1.8							
09130302178014	33	Selection-Canopy Gaps				0.2	0.0									
09130302178021	33	Salvage		0.2		0.0										
09130302179012	6	Shelterwood-Burn					0.3									
09130302180001	110	Selection-Canopy Gaps		0.5									0.0			
09130302180002	42	Thin		1.6		0.0										
09130302180021	38	Coppice-ASP		0.3												
09130302180024	17	Thin		1.2			0.0									
09130302180040	12	Thin		1.2		0.1			0.1							
09130302180045	7	Thin					0.2									
09130302181010	34	Selection-Canopy Gaps					0.2									
09130302181026	6	Clearcut-MSP					0.2									
09130302181033	2	Shelterwood-MSP				0.2										
09130302182010	12	Thin		1.2												
09130302182011	81	Restoration Thin-MSP-Burn		0.4												
09130302182016	18	Thin		0.2												
09130302182025	6	Selection-Canopy Gaps				0.1										
09130302182035	8	Restoration Thin-MSP-Burn		3.2												
09130302183001	27	Thin		0.8												
09130302185014	27	Thin		0.2		1.1	0.2									
09130302185026	33	Selection-Canopy Gaps		0.1												
09130302185042	22	Thin		1.3												

09130302186005	31	Selection-Canopy Gaps			0.0	0.0										
09130302186009	27	Thin				0.0	0.0									
09130302186013	16	Thin				0.0										
09130302186016	34	Coppice-ASP		0.8					0.3							
09130302186017	11	Thin					0.0									
09130302186022	16	Thin		0.1												
09130302186026	5	Thin			0.0	0.0										
09130302186027	2	Selection-Canopy Gaps			0.0	0.0										
09130302187034	1	Coppice-ASP		0.3		0.3	0.3									
09130302189003	39	Selection-Canopy Gaps							0.5							
09130302189005	2	Thin				0.4										
09130302189020	7	Selection-Canopy Gaps												0.0		
09130302189025	32	Selection-Canopy Gaps				0.8										
09130302189029	6	Thin				1.3			0.0							
09130302190001	23	Thin				1.8										
09130302190002	36	Thin				4.3										
09130302190004	4	Thin				0.0			0.0							
09130302190008	38	Thin					0.2									
09130302190014	18	Thin							0.4							
09130302190018	13	Thin				0.8								0.2		
09130302190029	22	Thin							0.3							
09130302190034	4	Selection-Canopy Gaps											0.1			
09130302190035	25	Selection-Canopy Gaps				0.0										
09130302190040	19	Clearcut-MSP					0.2									
09130302191002	31	Thin		0.1		3.3										
09130302191016	77	Thin			1.2	7.1	1.0									
09130302191025	7	Selection-Canopy Gaps				0.4										
09130302191046	36	Selection-Canopy Gaps												0.0		
09130302191079	36	Selection-Canopy Gaps				0.0								0.0		
09130302192002	105	Thin				1.0								0.1		
09130302192004	32	Thin		2.7		0.9										
09130302192025	75	Selection-Canopy Gaps				0.2								0.0		
09130302192073	10	Selection-Canopy Gaps												0.1		
09130302193036	8	Selection-Canopy Gaps												0.2		
09130302194015	17	Thin						1.7	2.1							
09130302194022	21	Thin						0.9	0.6							
09130302194027	5	Selection-Canopy Gaps							0.6							
09130302194028	8	Thin				2.2		4.7	2.3							
09130302194029	12	Selection-Canopy Gaps				0.8			0.8							

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09130302194030	11	Thin			0.1	1.0			0.2							
09130302194053	14	Coppice-ASP				0.4										
09130302198013	13	Selection- Canopy Gaps														0. 3
09130302198021	38	Thin				1.0										
09130302198035	20	Thin				0.7										
09130302198039	14	Coppice-ASP			0.1	0.1										
09130302199005	31	Selection- Canopy Gaps									0.1	0.2				
09130302199007	9	Thin				1.1										
09130302199011	47	Selection- Canopy Gaps				1.0										
09130302207001	4	Thin				1.7										
09130302207008	80	Thin				1.9										
09130302207009	46	Selection- Canopy Gaps				4.2										
09130302207019	5	Thin		0.0												
09130302207021	5	Thin		0.5												
09130302207023	3	Clearcut-MSP		0.1												
09130302207024	14	Shelterwood- MSP		1.3	0.0											
09130302208011	149	Thin		2.2	0.2	1.4					0.0					
09130302208012	208	Thin			0.2	0.4	0.2									
09130302208015	8	Clearcut-ASP												0.4		
09130302208016	19	Selection- Canopy Gaps				1.2								0.8		
09130302208018	27	Thin		0.0		0.0						0.0				
09130302208019	32	Selection- Canopy Gaps		0.2		0.3						0.2				
09130302208021	7	Selection- Canopy Gaps				0.0										
09130302209001	7	Thin		0.3												
09130302210026	25	Selection- Canopy Gaps			0.1											
09130302211005	124	Coppice-ASP		0.0		0.2										
09130302211017	35	Thin				0.2										
09130302211018	29	Shelterwood- MSP				0.9										
09130302211032	10	PCT		0.1												
09130302211035	5	Thin				1.3										
09130302216003	92	Selection- Canopy Gaps			0.0	0.0			1.6							
09130302216007	15	Selection- Canopy Gaps				0.1	0.2									
09130302216011	37	Selection- Canopy Gaps							0.4							
09130302216014	46	Selection- Canopy Gaps		0.4												
09130302216017	11	Selection- Canopy Gaps			0.1	0.0			0.3							
09130302216022	83	Selection- Canopy Gaps		0.5		0.1										
09130302217005	28	Selection- Canopy Gaps		0.2												
09130302217013	11	Clearcut-MSP		0.0												

09130302217014	29	Clearcut-MSP		0.3												
09130302217046	20	Thin			0.2	1.0										
09130302218008	4	Thin			0.1											
09130302218010	13	Thin		0.0												
09130302219012	86	Selection-Canopy Gaps				0.0			1.5							
09130302219013	102	Coppice-ASP							0.1							
09130302219029	5	Thin			0.3	0.3										
09130302220001	91	Selection-Canopy Gaps	0.1		0.5	0.8										
09130302221001	21	Selection-Canopy Gaps		0.1												
09130302221023	30	Selection-Canopy Gaps		0.1		0.1										
09130302222001	276	Selection-Canopy Gaps	0.2		0.7	0.8										
09130302222020	19	Selection-Canopy Gaps		0.6												
09130302224017	22	Selection-Canopy Gaps	0.2		0.3	0.3										
09130302301036	133	Selection-Argonne				1.2	0.3	0.0								
09130302301044	39	Selection-Argonne				0.3			0.3							
09130302302016	10	Selection-Argonne			0.1	1.2			1.2							
09130302302017	10	Selection-Argonne			0.5	1.2			0.9							
09130302302030	10	Selection-Argonne			0.0	0.4			1.3							
09130302302034	114	Selection-Argonne			0.2	1.4			3.1				0.0			
09130302302035	122	Selection-Argonne			0.3	1.1			2.2				0.0			

Abbreviations Used

ASP-Aspen Site Preparation
MSP-Mechanical Site Preparation
PCT-Precommercial Thinning

Appendix C

Stands proposed for treatment in Alternatives 2 and 3 in the Morgan Lake Project area that are within 0.25 miles of an NNIP infestation and the respective area (ac) and species.

Stand ID	Area	Proposed	N	Species
09130302001001	16.0	Partial Overstory Removal	5	CEBI2, CIPA6, CIVU, TAVU*
09130302001005	18.6	Thin	2	CEBI2, TAVU
09130302001006	37.7	PCT-MSP	1	TAVU*
09130302001008	4.0	Sanitation	2	CEBI2, TAVU
09130302001009	18.0	Thin	6	CEBI2, CIAR4, CIPA6, CIVU
09130302001010	42.5	Thin	1	CIPA6*
09130302001024	17.7	Clearcut-MSP	3	CIPA6, CIVU, TAVU

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09130302001030	144.1	Selection-Canopy Gaps	8	CEBI2, CIAR4, CIPA6, CIVU, TAVU*
09130302001032	114.2	Sanitation	3	CIPA6, PHAR3, TAVU*
09130302001037	11.5	Selection-Canopy Gaps	2	CIPA6
09130302001038	26.9	Improvement	4	CIPA6, CIVU, PHAR3, TAVU
09130302001040	5.3	Selection-Canopy Gaps	2	CEBI2, CIVU*
09130302001044	1.5	Thin	1	TAVU*
09130302001100	8.9	Salvage	1	CIAR4
09130302002001	42.4	Shelterwood	7	CEBI2, CIAR4, CIVU, PHAR3, TAVU*
09130302002002	9.1	Thin	8	CEBI2, CIPA6, CIVU, PHAR3, TAVU*
09130302002006	4.4	Thin	10	CEBI2, CIPA6, CIVU, PHAR3, TAVU*
09130302002008	5.8	Thin	6	CEBI2, CIPA6, CIVU, PHAR3, TAVU*
09130302002010	5.4	Selection-Canopy Gaps	4	ALPE4, CIPA6, PHAR3
09130302002011	13.2	Thin	3	CIAR4, CIVU*
09130302002012	206.1	Selection-Canopy Gaps	13	ALPE4, CEBI2, CIAR4, CIPA6, CIVU, PHAR3, TAVU*
09130302002013	2.8	Thin	1	CIAR4*
09130302002014	1.5	Thin	5	CIAR4, CIPA6, CIVU, PHAR3
09130302002016	27.3	Thin	7	CIAR4, CIPA6, CIVU, PHAR3
09130302002018	187.5	Thin	7	CIPA6, CIVU, PHAR3, TAVU*
09130302002021	107.5	Selection-Canopy Gaps	4	CIAR4, CIVU, PHAR3*
09130302002022	35.6	Improvement	3	CIPA6, CIVU, PHAR3, TAVU
09130302002024	8.6	Thin	2	CIPA6, CIVU
09130302002026	14.8	Coppice-ASP	3	CIPA6, CIVU
09130302002029	17.5	Selection-Canopy Gaps	2	ALPE4, CIVU*
09130302003004	12.1	Thin	1	PHAR3*
09130302003006	10.9	Partial Overstory Removal	2	CEBI2, CIVU*
09130302003008	55.7	Thin	4	CEBI2, CIAR4, CIVU*
09130302003012	10.6	Selection-Canopy Gaps	7	CEBI2, CIAR4, CIPA6, PHAR3
09130302003013	4.3	Thin	4	CEBI2, CIPA6, PHAR3
09130302003015	14.1	Thin	5	CIAR4, CIPA6, CIVU, PHAR3
09130302003017	6.9	Selection-Canopy Gaps	1	PHAR3
09130302003018	2.7	Thin	1	CIVU
09130302003024	2.1	Thin	1	CIVU
09130302003025	30.8	Coppice-ASP	6	CEBI2, CIAR4, CIPA6, PHAR3
09130302003026	2.6	Clearcut-MSP	4	CIAR4, CIPA6, PHAR3
09130302007002	4.6	Selection-Canopy Gaps	2	CIVU*
09130302007005	6.5	Clearcut-ASP	2	CIVU, PHAR3
09130302007006	24.2	Thin	1	TAVU*
09130302007007	4.8	Salvage	4	CIVU, PHAR3*
09130302007009	11.6	Selection-Canopy Gaps	2	CIVU, TAVU*
09130302007017	1.9	Clearcut	2	CIVU, PHAR3
09130302007022	29.9	Thin	2	CIVU, PHAR3
09130302007026	41.1	Thin	3	CIPA6, CIVU, TAVU*
09130302008002	99.1	Clearcut	1	CIPA6*
09130302008004	4.0	Thin	1	PHAR3*
09130302008005	49.4	Selection-Canopy Gaps	2	CIPA6, PHAR3, TAVU*
09130302011009	117.5	Thin	13	AEPO, CEBI2, CIAR4, CIPA6, CIVU, PHAR3*
09130302013012	37.8	Shelterwood-MSP	5	CEBI2, CIAR4, CIPA6*
09130302013017	9.2	Thin	4	CEBI2, CIAR4, CIPA6*
09130302013020	11.5	Shelterwood-MSP	3	ALPE4, CIVU, PHAR3
09130302013026	5.2	Shelterwood-MSP	1	CIVU
09130302013032	20.2	Overstory Removal	2	ALPE4, PHAR3
09130302014013	63.7	Selection-Canopy Gaps	4	ALPE4, CIAR4, CIPA6*
09130302014014	30.2	Selection-Canopy Gaps	6	ALPE4, CIAR4, CIVU
09130302014015	18.0	Thin	1	ALPE4
09130302014016	14.0	Thin	3	CIPA6*

09130302015001	107.7	Selection-Canopy Gaps	4	ALPE4, CIAR4, CIPA6*
09130302016001	3.9	Thin	3	CEBI2, CIVU, TAVU
09130302016003	28.7	Thin	2	CEBI2, PHAR3*
09130302016004	9.4	Selection-Canopy Gaps	1	CIAR4*
09130302016006	12.6	Salvage	6	CIAR4, CIVU, PHAR3, TAVU*
09130302016008	130.2	Selection-Canopy Gaps	6	CIAR4, CIVU, PHAR3, TAVU*
09130302016009	27.5	Selection-Canopy Gaps	6	CEBI2, CIAR4, CIPA6, CIVU, PHAR3, TAVU
09130302016010	38.4	Selection-Canopy Gaps	5	CEBI2, CIPA6, CIVU, TAVU
09130302016014	6.1	Thin	5	CIAR4, CIPA6, CIVU, PHAR3, TAVU
09130302019002	128.9	Selection-Canopy Gaps	5	CIPA6
09130302019003	239.9	Selection-Canopy Gaps	3	CIPA6*
09130302019004	11.5	Thin	2	CIPA6*
09130302019005	6.2	Coppice-ASP	2	CIPA6*
09130302019009	24.9	Selection-Canopy Gaps	3	CIPA6*
09130302019012	9.4	Coppice-ASP	3	CIPA6
09130302019013	12.6	Selection-Canopy Gaps	1	CIPA6
09130302019021	6.3	Thin	1	CIPA6
09130302020002	9.5	Thin	1	CIPA6
09130302020003	22.3	Salvage	2	CIPA6*
09130302020004	26.4	Improvement	1	CIPA6
09130302020028	4.9	Overstory Removal	2	CIPA6
09130302020029	34.8	Selection-Canopy Gaps	2	CIPA6
09130302177009	28.3	Selection-Canopy Gaps	3	CEBI2, CIPA6, CIVU*
09130302177010	48.1	Thin	5	CEBI2, CIAR4, CIPA6, CIVU*
09130302177017	26.9	Selection-Canopy Gaps	2	CIAR4, PHAR3
09130302177020	37.3	Selection-Canopy Gaps	3	CIAR4, CIPA6, PHAR3
09130302177021	15.4	Selection-Canopy Gaps	2	CIPA6, PHAR3*
09130302177030	6.3	Selection-Canopy Gaps	3	CEBI2, CIPA6, CIVU*
09130302177036	80.5	Thin	4	CEBI2, CIAR4
09130302177040	39.9	Selection-Canopy Gaps	3	CIAR4, CIPA6, PHAR3
09130302177041	4.7	Coppice-ASP	3	CEBI2, CIAR4
09130302177044	16.6	Thin	5	CEBI2, CIAR4, CIPA6, PHAR3*
09130302177045	24.0	Overstory Removal	3	CEBI2, CIAR4
09130302177048	1.5	Thin	4	CEBI2, CIAR4, CIVU
09130302178002	17.0	Selection-Canopy Gaps	4	CIPA6, CIVU, PHAR3
09130302178003	32.0	Coppice-ASP	10	CEBI2, CIAR4, CIPA6, CIVU, PHAR3
09130302178005	4.7	Selection-Canopy Gaps	3	CEBI2, CIPA6, CIVU*
09130302178006	5.0	Selection-Canopy Gaps	6	CEBI2, CIAR4, CIPA6, CIVU*
09130302178008	14.0	Selection-Canopy Gaps	6	CEBI2, CIAR4, CIPA6, CIVU, PHAR3
09130302178011	28.6	PCT	1	CIPA6
09130302178014	33.2	Selection-Canopy Gaps	8	CEBI2, CIAR4, CIPA6, PHAR3*
09130302178019	34.4	Thin	2	CEBI2, CIPA6
09130302178045	2.6	Thin	6	CEBI2, CIAR4, CIPA6, CIVU
09130302180001	109.8	Selection-Canopy Gaps	6	CIAR4, CIPA6, PHAR3*
09130302180002	42.5	Thin	5	CIAR4, CIPA6, PHAR3*
09130302180003	12.6	Selection-Canopy Gaps	3	CEBI2, CIAR4, PHAR3
09130302180005	24.2	Thin	1	CIVU
09130302180011	11.8	Selection-Canopy Gaps	4	CEBI2, CIAR4, CIPA6, PHAR3
09130302180012	38.2	Shelterwood-MSP	3	CEBI2, CIAR4, PHAR3
09130302180014	7.3	Selection-Canopy Gaps	1	CIVU
09130302180016	7.8	Thin	2	CIAR4, CIPA6
09130302180018	48.7	Thin	4	CEBI2, CIAR4, CIPA6, CIVU
09130302180021	38.1	Coppice-ASP	2	CEBI2, CIPA6*
09130302180023	14.1	Overstory Removal	2	CEBI2
09130302180024	17.1	Thin	4	CIAR4, CIPA6, CIVU*

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09130302180032	9.1	Shelterwood-MSP	1	CEBI2
09130302180033	17.5	Selection-Canopy Gaps	4	CEBI2, CIAR4, CIVU
09130302180040	12.4	Thin	7	CEBI2, CIPA6, CIVU, PHAR3*
09130302180076	5.3	Coppice-ASP	3	CEBI2, CIPA6
09130302180080	14.0	Shelterwood-MSP	7	CEBI2, CIAR4, CIPA6, PHAR3
09130302181001	3.5	Shelterwood-MSP	2	CEBI2, CIPA6
09130302181002	11.0	Thin	2	CEBI2, CIPA6
09130302181004	9.8	Thin	2	CEBI2, CIVU
09130302181005	12.4	Shelterwood-Burn	2	CEBI2, CIPA6
09130302181006	4.6	Thin	2	CEBI2, CIPA6
09130302181010	33.5	Selection-Canopy Gaps	1	CEBI2*
09130302181013	9.3	Thin	1	CEBI2
09130302181015	57.2	Thin	2	CEBI2, CIVU
09130302181022	21.5	Thin	3	CIPA6, CIVU, PHAR3
09130302181026	5.8	Clearcut-MSP	2	CIPA6, PHAR3*
09130302181033	1.7	Shelterwood-MSP	1	CEBI2*
09130302181035	4.3	Coppice-ASP	1	CEBI2
09130302181036	6.2	Thin	2	CEBI2, CIPA6
09130302181037	6.4	Thin	1	CEBI2
09130302182001	5.8	Shelterwood-MSP-Burn	1	PHAR3
09130302182002	41.3	Shelterwood-MSP-Burn	1	PHAR3
09130302182004	16.9	Improvement-Burn	3	CEBI2, CIPA6, PHAR3
09130302182006	5.6	Coppice-Burn	1	PHAR3
09130302182011	81.0	Restoration Thin-MSP-Burn	2	CIPA6, PHAR3*
09130302182019	5.6	Restoration Thin-MSP-Burn	1	PHAR3
09130302182020	1.9	Shelterwood-MSP-Burn	1	PHAR3
09130302182021	5.7	Clearcut-MSP-Burn	1	PHAR3
09130302182022	2.8	Shelterwood-Burn	2	CEBI2, CIPA6
09130302182023	2.1	Thin	2	CEBI2, CIPA6
09130302182024	4.1	Restoration Thin-MSP-Burn	2	CEBI2, CIPA6
09130302182025	5.9	Selection-Canopy Gaps	1	CEBI2*
09130302182026	6.0	Thin-Burn	2	CEBI2, CIPA6
09130302182027	12.1	Coppice-MSP-Burn	2	CEBI2, CIPA6
09130302182028	4.5	Restoration Thin-MSP-Burn	2	CEBI2, CIPA6
09130302182031	2.8	Restoration Thin-MSP-Burn	2	CEBI2, CIPA6
09130302182040	4.1	Coppice-Burn	1	CEBI2
09130302182046	1.1	Coppice-ASP	1	CEBI2
09130302182104	0.7	None-MSP-Burn	1	PHAR3
09130302183003	8.7	Thin	3	CIPA6, CIVU, PHAR3
09130302183004	34.8	Thin	3	CEBI2, CIPA6, PHAR3
09130302183006	25.4	Thin	1	CEBI2
09130302183009	6.4	Thin	1	CEBI2
09130302183040	9.0	Thin	1	CIPA6
09130302183048	1.3	Thin	1	CIPA6
09130302185008	22.9	Thin	3	CEBI2, CIPA6, CIVU
09130302185012	12.1	Thin	2	CIVU, PHAR3
09130302185014	27.3	Thin	3	CEBI2, CIAR4, PHAR3*
09130302185022	14.8	Thin	2	CIPA6, PHAR3
09130302185025	13.5	Selection-Canopy Gaps	1	CEBI2
09130302185026	33.2	Selection-Canopy Gaps	1	PHAR3*
09130302185027	5.3	Thin	1	CEBI2
09130302185028	18.6	Selection-Canopy Gaps	3	CEBI2, CIPA6, PHAR3
09130302185031	11.1	Selection-Canopy Gaps	3	CIAR4, CIPA6
09130302185033	5.7	Selection-Canopy Gaps	1	PHAR3
09130302185035	1.0	Thin	2	CIPA6, PHAR3

09130302185036	1.3	Thin	2	CIPA6, PHAR3
09130302185040	9.4	Overstory Removal	1	CIVU
09130302185042	22.1	Thin	6	CEBI2, CIPA6, CIVU, PHAR3*
09130302185044	3.8	Coppice-ASP	2	CIVU, PHAR3
09130302186002	11.7	Selection-Canopy Gaps	5	CIPA6, CIVU
09130302186003	15.9	Selection-Canopy Gaps	2	CIPA6, PHAR3
09130302186004	13.6	Selection-Canopy Gaps	3	CEBI2, CIPA6, PHAR3
09130302186005	31.1	Selection-Canopy Gaps	5	CEBI2, CIPA6, PHAR3*
09130302186006	31.3	Thin	2	CIPA6, PHAR3
09130302186007	140.7	Selection-Canopy Gaps	8	CEBI2, CIAR4, CIPA6, CIVU, PHAR3
09130302186009	26.9	Thin	2	CIPA6, CIVU*
09130302186013	16.2	Thin	2	CIAR4, CIPA6*
09130302186014	11.3	Selection-Canopy Gaps	3	CIAR4, CIPA6
09130302186015	13.4	Improvement	3	CIAR4, CIPA6
09130302186016	33.8	Coppice-ASP	4	CIPA6, CIVU*
09130302186017	10.9	Thin	7	CEBI2, CIPA6, PHAR3*
09130302186022	15.9	Thin	8	CEBI2, CIAR4, CIPA6, CIVU, PHAR3*
09130302186025	8.0	Thin	3	CIAR4, CIPA6
09130302186026	5.1	Thin	1	CIPA6*
09130302186027	2.0	Selection-Canopy Gaps	1	CIPA6*
09130302186028	6.1	Thin	5	CEBI2, CIPA6, CIVU, PHAR3
09130302186036	5.4	Coppice-ASP	3	CIPA6
09130302186040	12.1	Selection-Canopy Gaps	1	CIPA6
09130302186043	7.2	Thin	1	CIPA6
09130302187008	5.7	Selection-Canopy Gaps	3	CEBI2, CIPA6, CIVU
09130302187020	2.2	Selection-Canopy Gaps	4	CEBI2, CIPA6, CIVU
09130302187021	14.4	Thin	1	CEBI2
09130302187024	5.6	Thin	1	PHAR3
09130302187041	1.7	Thin	1	CEBI2
09130302188001	22.1	Salvage	3	CIPA6, PHAR3
09130302189001	25.8	Coppice-ASP	6	CIPA6, PHAR3
09130302189003	38.6	Selection-Canopy Gaps	7	CIPA6, PHAR3*
09130302189004	5.3	Coppice-ASP	2	CIPA6, PHAR3
09130302189005	2.3	Thin	1	PHAR3*
09130302189008	15.1	Selection-Canopy Gaps	3	CIPA6, PHAR3
09130302189011	10.8	Overstory Removal	7	CIAR4, CIPA6, PHAR3
09130302189014	48.9	Coppice-ASP	1	CIPA6
09130302189020	7.0	Selection-Canopy Gaps	4	CIPA6, PHAR3*
09130302189025	32.5	Selection-Canopy Gaps	1	PHAR3*
09130302189029	5.6	Thin	1	CIPA6*
09130302189031	13.0	Coppice-ASP	1	CIPA6
09130302190001	22.7	Thin	4	CEBI2, CIPA6, PHAR3*
09130302190002	36.2	Thin	5	CEBI2, CIAR4, CIPA6, CIVU, PHAR3*
09130302190008	38.0	Thin	4	CIAR4, CIPA6, PHAR3*
09130302190010	69.9	Improvement	1	CIPA6
09130302190014	18.5	Thin	6	CIAR4, CIPA6, PHAR3*
09130302190018	12.5	Thin	4	CIAR4, CIPA6*
09130302190029	21.6	Thin	9	CIAR4, CIPA6, CIVU, PHAR3*
09130302190034	4.3	Selection-Canopy Gaps	2	CIAR4, CIPA6*
09130302190035	25.1	Selection-Canopy Gaps	5	CIPA6, PHAR3*
09130302190040	19.0	Clearcut-MSP	3	CIAR4, CIPA6, PHAR3*
09130302190041	1.8	Thin	3	CEBI2, CIPA6
09130302190047	2.7	Coppice-ASP	2	CIPA6
09130302190049	11.8	Shelterwood-MSP	3	CIPA6, PHAR3
09130302191002	31.1	Thin	11	CIAR4, CIPA6, CIVU, PHAR3*

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09130302191003	3.5	Thin	9	CIAR4, CIPA6, CIVU, PHAR3
09130302191016	76.6	Thin	6	CEBI2, CIAR4, CIPA6, CIVU, PHAR3*
09130302191025	6.7	Selection-Canopy Gaps	3	CEBI2, CIAR4, CIPA6*
09130302191044	14.7	Selection-Canopy Gaps	2	CIPA6
09130302191046	36.4	Selection-Canopy Gaps	3	CEBI2, CIPA6, PHAR3*
09130302191069	7.6	Thin	3	CIPA6, CIVU
09130302192002	104.6	Thin	2	CEBI2, CIPA6*
09130302192004	31.6	Thin	5	CIPA6, PHAR3*
09130302192019	34.3	Overstory Removal	3	CIPA6
09130302192025	75.0	Selection-Canopy Gaps	3	CIPA6*
09130302192026	43.8	Improvement	1	CIPA6
09130302192049	5.8	Thin	3	CIPA6
09130302192062	9.5	Thin	6	CEBI2, CIPA6
09130302192071	17.9	Selection-Canopy Gaps	2	CIPA6
09130302192073	9.6	Selection-Canopy Gaps	5	CEBI2, CIPA6*
09130302193012	30.9	Selection-Canopy Gaps	1	BETH
09130302193013	29.8	Selection-Canopy Gaps	1	BETH
09130302193016	16.9	Selection-Canopy Gaps	2	CIPA6
09130302193017	21.4	Selection-Canopy Gaps	1	BETH
09130302193018	23.6	Selection-Canopy Gaps	1	BETH
09130302193036	7.6	Selection-Canopy Gaps	1	CIPA6*
09130302193039	1.7	Selection-Canopy Gaps	1	BETH
09130302193040	16.6	Selection-Canopy Gaps	1	BETH
09130302194015	17.2	Thin	5	CIPA6, EUES*
09130302194017	12.1	Thin	6	CEBI2, CIAR4, CIPA6, EUES, PHAR3
09130302194019	14.4	Thin	1	CIPA6
09130302194020	25.7	Selection-Canopy Gaps	1	CIPA6
09130302194021	64.4	Thin	1	CIPA6
09130302194022	20.6	Thin	6	CIPA6, EUES*
09130302194027	4.6	Selection-Canopy Gaps	5	CIPA6, EUES*
09130302194028	7.9	Thin	5	CIAR4, CIPA6, EUES, PHAR3*
09130302194029	12.0	Selection-Canopy Gaps	11	CIAR4, CIPA6, EUES, PHAR3*
09130302194030	11.3	Thin	8	CIAR4, CIPA6, EUES*
09130302194033	12.2	Selection-Canopy Gaps	3	EUES
09130302194037	18.7	Selection-Canopy Gaps	12	CIAR4, CIPA6, CIVU, EUES, PHAR3
09130302194053	14.3	Coppice-ASP	3	EUES, PHAR3*
09130302194054	4.4	Coppice-ASP	1	CIPA6
09130302198010	2.5	Shelterwood-MSP	4	CIAR4, CIPA6, LONIC
09130302198012	6.5	Shelterwood-MSP	1	LONIC
09130302198013	13.3	Selection-Canopy Gaps	3	CIAR4, CIPA6*
09130302198014	6.7	Selection-Canopy Gaps	3	CIAR4, CIPA6
09130302198019	5.6	Clearcut-MSP	1	CIPA6
09130302198021	37.6	Thin	2	CIPA6*
09130302198023	24.1	Thin	3	CIPA6
09130302198034	13.0	Selection-Canopy Gaps	3	CIPA6
09130302198038	8.1	Thin	1	LONIC
09130302198039	14.3	Coppice-ASP	2	CIPA6, LONIC*
09130302198044	13.6	Coppice-ASP	3	CIAR4, CIPA6
09130302198045	4.4	Selection-Canopy Gaps	3	CIAR4, CIPA6
09130302198046	20.5	Selection-Canopy Gaps	3	CIAR4, CIPA6
09130302198047	21.8	Coppice-ASP	1	CIPA6
09130302198051	6.5	Selection-Canopy Gaps	1	CIPA6
09130302198052	13.8	Shelterwood-MSP	1	CIPA6
09130302198057	9.2	Thin	3	CEBI2, CIAR4
09130302199005	30.9	Selection-Canopy Gaps	5	CEBI2, CIPA6*

09130302199007	9.4	Thin	4	CIPA6*
09130302199009	8.7	Selection-Canopy Gaps	3	CIPA6
09130302199010	24.5	Thin	5	CIAR4, CIPA6
09130302199011	47.3	Selection-Canopy Gaps	6	CEBI2, CIAR4, CIPA6*
09130302199018	2.4	Thin	2	CIPA6
09130302207001	4.1	Thin	2	CEBI2, PHAR3*
09130302207004	1.9	Thin	2	CEBI2, PHAR3
09130302207005	43.1	Selection-Canopy Gaps	2	CIPA6, PHAR3
09130302207007	24.8	Selection-Canopy Gaps	2	CIPA6, PHAR3
09130302207008	79.5	Thin	3	CEBI2, PHAR3*
09130302207009	46.2	Selection-Canopy Gaps	3	CEBI2, PHAR3*
09130302207012	5.9	Coppice-ASP	1	CIPA6
09130302207013	13.8	Selection-Canopy Gaps	2	CEBI2, CIPA6
09130302207019	4.7	Thin	3	CEBI2, CIAR4*
09130302207021	4.5	Thin	4	CEBI2, CIAR4*
09130302207023	3.1	Clearcut-MSP	4	CEBI2, CIAR4*
09130302207024	14.1	Shelterwood-MSP	2	CEBI2*
09130302207027	6.9	Selection-Canopy Gaps	3	CEBI2, CIPA6
09130302207049	4.6	Coppice-ASP	2	CEBI2
09130302208007	19.3	Selection-Canopy Gaps	3	CIPA6, CIVU
09130302208011	148.5	Thin	12	CEBI2, CIAR4, CIPA6, CIVU*
09130302208012	208.4	Thin	8	CIAR4, CIPA6, CIVU*
09130302208013	25.4	Selection-Canopy Gaps	8	CIAR4, CIPA6
09130302208014	11.6	Selection-Canopy Gaps	5	CIPA6, CIVU
09130302208015	7.7	Clearcut-ASP	1	CEBI2*
09130302208016	18.7	Selection-Canopy Gaps	2	CIPA6*
09130302208017	11.9	Selection-Canopy Gaps	11	CEBI2, CIAR4, CIPA6
09130302208018	27.3	Thin	9	CEBI2, CIAR4, CIPA6*
09130302208019	31.7	Selection-Canopy Gaps	6	CEBI2, CIAR4, CIPA6*
09130302208020	12.7	Selection-Canopy Gaps	7	CEBI2, CIAR4, CIPA6
09130302208021	7.0	Selection-Canopy Gaps	6	CEBI2, CIAR4, CIPA6*
09130302208042	12.6	Selection-Canopy Gaps	9	CIAR4, CIPA6, CIVU
09130302208044	1.5	Thin	2	CIPA6
09130302208046	5.8	Thin	3	CIPA6
09130302209002	4.3	Coppice-ASP	1	CEBI2
09130302209010	22.5	Thin	1	CEBI2
09130302209056	2.2	Clearcut-MSP	1	CEBI2
09130302210025	12.5	Overstory Removal	1	CIAR4
09130302211002	11.8	Selection-Canopy Gaps	1	CIPA6
09130302211005	124.0	Coppice-ASP	1	CIPA6*
09130302211011	21.9	Coppice-ASP	5	CEBI2, CIPA6, PHAR3
09130302211017	35.2	Thin	2	CEBI2, PHAR3*
09130302211018	29.2	Shelterwood-MSP	5	CEBI2, PHAR3*
09130302211022	35.4	Selection-Canopy Gaps	1	CIPA6
09130302211028	5.9	Coppice-ASP	2	CEBI2, CIPA6
09130302211029	20.9	Selection-Canopy Gaps	1	CIPA6
09130302211032	9.8	PCT	3	CIPA6, PHAR3*
09130302211035	4.8	Thin	2	CEBI2, PHAR3*
09130302211041	11.1	Coppice-ASP	2	CEBI2, CIPA6
09130302216001	36.1	Selection-Canopy Gaps	14	CEBI2, CIAR4, CIPA6, CIVU
09130302216002	31.5	Selection-Canopy Gaps	9	CEBI2, CIAR4, CIPA6
09130302216003	91.9	Selection-Canopy Gaps	6	CEBI2, CIAR4, CIPA6*
09130302216007	15.2	Selection-Canopy Gaps	9	CEBI2, CIAR4, CIPA6*
09130302216008	66.2	Selection-Canopy Gaps	9	CEBI2, CIAR4, CIPA6
09130302216011	36.6	Selection-Canopy Gaps	2	CIPA6*

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09130302216014	46.2	Selection-Canopy Gaps	9	CEBI2, CIAR4, CIPA6, CIVU*
09130302216015	25.2	Coppice-ASP	3	CIPA6, PHAR3
09130302216017	10.6	Selection-Canopy Gaps	2	CIPA6*
09130302216023	8.2	Coppice-ASP	2	CEBI2, CIPA6
09130302216032	8.8	Thin	2	CEBI2, CIPA6
09130302216034	9.7	Overstory Removal	1	PHAR3
09130302217001	8.7	Thin	1	CEBI2
09130302217005	28.2	Selection-Canopy Gaps	1	PHAR3*
09130302217013	11.1	Clearcut-MSP	2	CEBI2, CIAR4*
09130302217014	28.7	Clearcut-MSP	1	PHAR3*
09130302217015	28.4	Selection-Canopy Gaps	1	CEBI2
09130302217023	16.3	Overstory Removal	1	CIAR4
09130302217047	21.8	Overstory Removal	4	CEBI2, CIAR4, CIPA6, PHAR3
09130302217049	5.9	Overstory Removal	1	CEBI2
09130302217050	41.6	Selection-Canopy Gaps	2	CEBI2, PHAR3
09130302217051	92.6	Selection-Canopy Gaps	2	CEBI2, CIAR4
09130302217052	9.1	Coppice-ASP	1	CIAR4
09130302218008	4.5	Thin	1	CEBI2*
09130302218015	44.0	Thin	1	PHAR3
09130302218017	15.2	Restoration Thin-MSP-Burn	1	PHAR3
09130302218030	26.7	Coppice-ASP	1	CEBI2
09130302218031	9.9	Coppice-ASP	1	CEBI2
09130302218041	26.0	Coppice-ASP	1	CEBI2
09130302219004	28.0	Selection-Canopy Gaps	3	CIAR4, CIPA6, PHAR3
09130302219009	22.4	Selection-Canopy Gaps	3	CIAR4, CIPA6, PHAR3
09130302219012	86.0	Selection-Canopy Gaps	4	CIAR4, CIPA6*
09130302219013	102.1	Coppice-ASP	4	CIAR4, CIPA6*
09130302219015	34.1	Thin	1	CEBI2
09130302220028	36.1	Selection-Canopy Gaps	1	CIPA6
09130302220034	20.0	Selection-Canopy Gaps	3	CEBI2, CIPA6
09130302221001	20.7	Selection-Canopy Gaps	2	CIPA6*
09130302221003	6.1	Coppice-ASP	3	CEBI2, CIPA6
09130302221008	25.2	Restoration Thin-MSP-Burn	1	PHAR3
09130302221009	6.1	Restoration Thin-MSP-Burn	1	PHAR3
09130302221014	1.8	Shelterwood	3	CEBI2, CIPA6
09130302221023	29.9	Selection-Canopy Gaps	2	CEBI2, CIPA6*
09130302222001	276.3	Selection-Canopy Gaps	7	ALPE4, CEBI2, CIAR4*
09130302222020	19.1	Selection-Canopy Gaps	1	CIPA6*
09130302224004	81.2	Selection-Canopy Gaps	2	PHAR3
09130302224009	21.6	Selection-Canopy Gaps	5	ALPE4, CIAR4, CIPA6
09130302224017	21.6	Selection-Canopy Gaps	3	ALPE4, CIAR4*
09130302301015	10.1	Selection-Argonne	3	CIAR4, CIPA6
09130302301016	9.5	Selection-Argonne	3	CIPA6, PHAR3
09130302301036	133.3	Selection-Argonne	12	CIAR4, CIPA6, PHAR3*
09130302301043	9.7	Selection-Argonne	2	CIPA6, PHAR3
09130302302016	10.1	Selection-Argonne	3	CIAR4, CIPA6, PHAR3*
09130302302017	10.0	Selection-Argonne	3	CIAR4, CIPA6, PHAR3*
09130302302018	9.8	Selection-Argonne	6	CIAR4, CIPA6, PHAR3
09130302302028	9.8	Selection-Argonne	1	PHAR3
09130302302029	9.7	Selection-Argonne	1	PHAR3
09130302302030	9.9	Selection-Argonne	2	CIAR4, CIPA6*
09130302302034	114.2	Selection-Argonne	4	CIAR4, CIPA6, PHAR3*
09130302302035	121.6	Selection-Argonne	6	CIAR4, CIPA6, PHAR3*

Abbreviations Used

ASP-Aspen Site Preparation
MSP-Mechanical Site Preparation
PCT-Precommercial Thinning

Appendix D

NNIP infestations and respective gross area (ac), percent cover, and infested area (ac) occurring within the Fourmile project area.

Infestation ID	Scientific Name	Common Name	Plant Code	Gross Area	Infested %	Infested Area
00913030029	Euphorbia esula	leafy spurge	EUES	7.38	10	0.74
09130300001	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300002	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300007	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300009	Cirsium arvense	Canada thistle	CIAR4	0.00	10	0.00
09130300010	Cirsium arvense	Canada thistle	CIAR4	0.20	100	0.20
09130300011	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300012	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300022	Cirsium arvense	Canada thistle	CIAR4	0.20	100	0.20

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09130300023	Centaurea stoebe	spotted knapweed	CEBI2	5.48	100	5.48
09130300029	Euphorbia esula	leafy spurge	EUES	8.79	20	1.76
09130300033	Cirsium arvense	Canada thistle	CIAR4	0.14	20	0.03
09130300034	Hypericum perforatum	common St. Johnswort	HYPE	0.21	20	0.04
09130300035	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300041	Cirsium arvense	Canada thistle	CIAR4	1.00	100	1.00
09130300051	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300100	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300105	Cirsium arvense	Canada thistle	CIAR4	1.91	50	0.95
09130300106	Cirsium arvense	Canada thistle	CIAR4	1.37	50	0.69
09130300110	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130300119	Cirsium arvense	Canada thistle	CIAR4	3.74	10	0.37
09130300132	Centaurea stoebe	spotted knapweed	CEBI2	1.00	100	1.00
09130301145	Cirsium arvense	Canada thistle	CIAR4	0.20	100	0.20
09130301151	Cirsium arvense	Canada thistle	CIAR4	0.20	100	0.20
09130301154	Arctium minus	lesser burdock	ARMI2	0.01	100	0.01
09130301166	Phalaris arundinacea	reed canarygrass	PHAR3	0.20	100	0.20
09130301168	Phalaris arundinacea	reed canarygrass	PHAR3	0.01	100	0.01
09130301177	Hypericum perforatum	common St. Johnswort	HYPE	0.01	100	0.01
09130301199	Cirsium palustre	marsh thistle	CIPA6	0.32	100	0.32
09130302206	Centaurea stoebe	spotted knapweed	CEBI2	1.63	40	0.65
09130302207	Centaurea stoebe	spotted knapweed	CEBI2	0.12	100	0.12
09130302208	Centaurea stoebe	spotted knapweed	CEBI2	0.12	100	0.12
09130302209	Centaurea stoebe	spotted knapweed	CEBI2	0.12	100	0.12
09130302251	Cirsium arvense	Canada thistle	CIAR4	0.12	100	0.12
09130302252	Cirsium arvense	Canada thistle	CIAR4	0.12	100	0.12
09130302254	Cirsium arvense	Canada thistle	CIAR4	0.12	100	0.12
09130302505	Centaurea stoebe	spotted knapweed	CEBI2	0.36	100	0.36
09130302628	Euphorbia esula	leafy spurge	EUES	1.27	100	1.27
09130302629	Euphorbia esula	leafy spurge	EUES	1.27	100	1.27
09130302651	Hypericum perforatum	common St. Johnswort	HYPE	0.62	25	0.15
09130302698	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130302704	Centaurea stoebe	spotted knapweed	CEBI2	0.01	100	0.01
09130303016	Cirsium palustre	marsh thistle	CIPA6	0.01	100	0.01
09130303017	Phalaris arundinacea	reed canarygrass	PHAR3	0.01	100	0.01
09130303018	Phalaris arundinacea	reed canarygrass	PHAR3	0.12	100	0.12
09130303020	Cirsium palustre	marsh thistle	CIPA6	0.19	100	0.19
09130303023	Cirsium palustre	marsh thistle	CIPA6	0.01	100	0.01
09130303024	Cirsium palustre	marsh thistle	CIPA6	0.02	50	0.01
09130303026	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130303028	Cirsium palustre	marsh thistle	CIPA6	0.03	100	0.03
09130303029	Phalaris arundinacea	reed canarygrass	PHAR3	0.01	100	0.01
09130303030	Phalaris arundinacea	reed canarygrass	PHAR3	19.80	25	4.95
09130303041	Phalaris arundinacea	reed canarygrass	PHAR3	0.15	100	0.15
09130303057	Cirsium palustre	marsh thistle	CIPA6	0.43	100	0.43
09130303058	Phalaris arundinacea	reed canarygrass	PHAR3	0.43	100	0.43
09130303063	Cirsium palustre	marsh thistle	CIPA6	0.77	100	0.77
09130303064	Cirsium arvense	Canada thistle	CIAR4	1.45	100	1.45
09130303066	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130303067	Centaurea stoebe	spotted knapweed	CEBI2	20.51	75	15.38
09130303068	Cirsium arvense	Canada thistle	CIAR4	0.26	100	0.26
09130303069	Cirsium palustre	marsh thistle	CIPA6	0.04	100	0.04
09130303070	Cirsium palustre	marsh thistle	CIPA6	0.01	100	0.01
09130303072	Centaurea stoebe	spotted knapweed	CEBI2	0.13	100	0.13
09130303073	Phalaris arundinacea	reed canarygrass	PHAR3	0.06	100	0.06

09130303074	Cirsium palustre	marsh thistle	CIPA6	0.13	40	0.05
09130303075	Cirsium arvense	Canada thistle	CIAR4	0.28	100	0.28
09130303076	Cirsium palustre	marsh thistle	CIPA6	0.02	30	0.01
09130303077	Cirsium arvense	Canada thistle	CIAR4	0.12	100	0.12
09130303078	Cirsium palustre	marsh thistle	CIPA6	0.01	100	0.01
09130303079	Cirsium arvense	Canada thistle	CIAR4	0.09	100	0.09
09130303080	Cirsium palustre	marsh thistle	CIPA6	0.20	30	0.06
09130303081	Cirsium palustre	marsh thistle	CIPA6	0.09	100	0.09
09130303082	Cirsium arvense	Canada thistle	CIAR4	0.42	100	0.42
09130303083	Cirsium arvense	Canada thistle	CIAR4	0.22	100	0.22
09130303085	Cirsium palustre	marsh thistle	CIPA6	0.02	100	0.02
09130303086	Centaurea stoebe	spotted knapweed	CEBI2	0.46	30	0.14
09130303725	Alliaria petiolata	garlic mustard	ALPE4	804.48	5	40.22
09130304152	Alliaria petiolata	garlic mustard	ALPE4	0.02	25	0.01
09130304153	Aegopodium podagraria	bishop's goutweed	AEPO	0.04	100	0.04
09130304308	Alliaria petiolata	garlic mustard	ALPE4	0.06	100	0.06
09130304330	Centaurea stoebe	spotted knapweed	CEBI2	1.04	50	0.52
09130306100	Phalaris arundinacea	reed canarygrass	PHAR3	0.88	5	0.04
09130306171	Hypericum perforatum	common St. Johnswort	HYPE	1.04	20	0.21
09130306229	Phalaris arundinacea	reed canarygrass	PHAR3	0.09	5	0.00
09130306230	Phalaris arundinacea	reed canarygrass	PHAR3	0.05	100	0.05
09130306249	Cirsium arvense	Canada thistle	CIAR4	0.19	100	0.19
09130306253	Cirsium palustre	marsh thistle	CIPA6	0.44	25	0.11
09130306254	Cirsium palustre	marsh thistle	CIPA6	0.31	40	0.12
09130306256	Phalaris arundinacea	reed canarygrass	PHAR3	0.01	10	0.00
09130306257	Cirsium arvense	Canada thistle	CIAR4	0.01	100	0.01
09130306259	Cirsium palustre	marsh thistle	CIPA6	0.33	10	0.03
09130306261	Cirsium palustre	marsh thistle	CIPA6	0.02	10	0.00
09130306262	Hypericum perforatum	common St. Johnswort	HYPE	0.20	10	0.02
09130306999	Alliaria petiolata	garlic mustard	ALPE4	0.18	20	0.04
09130307128	Cirsium arvense	Canada thistle	CIAR4	0.06	10	0.01
09130307130	Cirsium palustre	marsh thistle	CIPA6	0.06	50	0.03
09130307135	Phalaris arundinacea	reed canarygrass	PHAR3	0.32	10	0.03
09130307152	Cirsium arvense	Canada thistle	CIAR4	0.01	10	0.00
09130307228	Centaurea stoebe	spotted knapweed	CEBI2	0.00	6	0.00
09130307229	Cirsium arvense	Canada thistle	CIAR4	0.01	57	0.00
09130307248	Centaurea stoebe	spotted knapweed	CEBI2	0.01	7	0.00
09130307249	Cirsium palustre	marsh thistle	CIPA6	0.00	10	0.00
09130307250	Cirsium palustre	marsh thistle	CIPA6	9.39	25	2.35
09130307251	Cirsium palustre	marsh thistle	CIPA6	6.18	15	0.93
09130307253	Cirsium palustre	marsh thistle	CIPA6	0.01	65	0.00
09130307254	Cirsium palustre	marsh thistle	CIPA6	0.01	55	0.00
09130307255	Cirsium palustre	marsh thistle	CIPA6	0.05	2	0.00
09130307256	Cirsium palustre	marsh thistle	CIPA6	0.01	40	0.00
09130307338	Centaurea stoebe	spotted knapweed	CEBI2	1.51	2	0.03
09130307339	Cirsium palustre	marsh thistle	CIPA6	0.21	50	0.11
09130307341	Cirsium arvense	Canada thistle	CIAR4	0.08	10	0.01
09130307366	Cirsium palustre	marsh thistle	CIPA6	0.03	4	0.00
09130307389	Cirsium palustre	marsh thistle	CIPA6	0.04	10	0.00
09130307391	Cirsium vulgare	bull thistle	CIVU	0.01	1	0.00
09130307392	Cirsium vulgare	bull thistle	CIVU	0.01	2	0.00
09130307469	Cirsium vulgare	bull thistle	CIVU	0.16	100	0.16
09130308016	Cirsium arvense	Canada thistle	CIAR4	16.72	5	0.84
09130308142	Centaurea stoebe	spotted knapweed	CEBI2	2.00	75	1.50
09130308143	Cirsium arvense	Canada thistle	CIAR4	2.01	100	2.01

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09130308303	Cirsium palustre	marsh thistle	CIPA6	0.40	2	0.01
09130308306	Cirsium palustre	marsh thistle	CIPA6	0.43	40	0.17
09130308307	Phalaris arundinacea	reed canarygrass	PHAR3	18.70	40	7.48
09130308320	Cirsium arvense	Canada thistle	CIAR4	3.14	30	0.94
09130308340	Cirsium palustre	marsh thistle	CIPA6	0.02	20	0.00
09130308343	Myosotis arvensis	field forget-me-not	MYAR	0.07	1	0.00
09130308344	Myosotis arvensis	field forget-me-not	MYAR	0.10	1	0.00
09130308345	Myosotis arvensis	field forget-me-not	MYAR	0.16	1	0.00
09130308362	Cirsium palustre	marsh thistle	CIPA6	0.18	1	0.00
09130309007	Hypericum perforatum	common St. Johnswort	HYPE	4.79	10	0.48
09130309038	Phalaris arundinacea	reed canarygrass	PHAR3	0.11	60	0.07
09130309042	Cirsium vulgare	bull thistle	CIVU	0.08	10	0.01
09130309043	Cirsium palustre	marsh thistle	CIPA6	0.08	10	0.01
09130310008	Cirsium palustre	marsh thistle	CIPA6	61.67	30	18.50
09130310029	Centaurea stoebe	spotted knapweed	CEBI2	3.94	50	1.97
09130310056	Cirsium palustre	marsh thistle	CIPA6	2.60	40	1.04
09130311016	Centaurea stoebe	spotted knapweed	CEBI2	1.94	90	1.74
09130311017	Centaurea stoebe	spotted knapweed	CEBI2	2.52	90	2.27
09130311020	Cirsium palustre	marsh thistle	CIPA6	4.59	70	3.21
09130311021	Cirsium palustre	marsh thistle	CIPA6	0.38	90	0.34
09130311029	Centaurea stoebe	spotted knapweed	CEBI2	2.52	70	1.76
09130311140	Cirsium palustre	marsh thistle	CIPA6	0.03	30	0.01
09130311141	Cirsium vulgare	bull thistle	CIVU	0.01	50	0.01
09130311142	Cirsium palustre	marsh thistle	CIPA6	0.05	60	0.03
09130311143	Cirsium palustre	marsh thistle	CIPA6	0.03	70	0.02
09130312053	Centaurea stoebe	spotted knapweed	CEBI2	0.22	100	0.22
09130312067	Alliaria petiolata	garlic mustard	ALPE4	0.03	60	0.02
09130313036	Alliaria petiolata	garlic mustard	ALPE4	0.22	50	0.11
09130314050	Centaurea stoebe	spotted knapweed	CEBI2	1.75	35	0.61
09130314051	Centaurea stoebe	spotted knapweed	CEBI2	1.69	30	0.51
09130314053	Centaurea stoebe	spotted knapweed	CEBI2	0.99	50	0.49
09130314083	Centaurea stoebe	spotted knapweed	CEBI2	3.18	10	0.32
09130314210	Cirsium palustre	marsh thistle	CIPA6	1.90	50	0.95
09130314227	Cirsium palustre	marsh thistle	CIPA6	2.53	25	0.63
09130314228	Cirsium palustre	marsh thistle	CIPA6	0.11	5	0.01
09130315017	Alliaria petiolata	garlic mustard	ALPE4	0.23	50	0.12
09130315110	Centaurea stoebe	spotted knapweed	CEBI2	1.68	50	0.84
09130316016	Alliaria petiolata	garlic mustard	ALPE4	0.24	50	0.12
09130317002	Lonicera spp.	honeysuckle	LONIC	1.17	2	0.02
09130317005	Cirsium palustre	marsh thistle	CIPA6	0.13	25	0.03
09130317019	Alliaria petiolata	garlic mustard	ALPE4	0.06	100	0.06
09130317034	Cirsium palustre	marsh thistle	CIPA6	0.07	50	0.04
09130317035	Cirsium palustre	marsh thistle	CIPA6	0.18	100	0.18
09130317036	Cirsium palustre	marsh thistle	CIPA6	0.39	50	0.20
09130317037	Cirsium palustre	marsh thistle	CIPA6	0.04	100	0.04
09130317107	Aegopodium podagraria	bishop's goutweed	AEPO	1.11	75	0.84
09130317108	Valeriana officinalis	garden valerian	VAOF	0.01	100	0.01
09130317109	Hypericum perforatum	common St. Johnswort	HYPE	2.66	50	1.33
09130317110	Hypericum perforatum	common St. Johnswort	HYPE	1.36	40	0.54
09130317111	Hypericum perforatum	common St. Johnswort	HYPE	4.34	30	1.30
09130317112	Tanacetum vulgare	common tansy	TAVU	26.67	25	6.67
09130317113	Tanacetum vulgare	common tansy	TAVU	0.12	100	0.12
09130317114	Tanacetum vulgare	common tansy	TAVU	0.56	25	0.14
09130317115	Tanacetum vulgare	common tansy	TAVU	0.10	25	0.03
09130317116	Tanacetum vulgare	common tansy	TAVU	0.33	25	0.08

09130317117	Tanacetum vulgare	common tansy	TAVU	0.16	25	0.04
09130317118	Tanacetum vulgare	common tansy	TAVU	0.21	25	0.05
09130317119	Tanacetum vulgare	common tansy	TAVU	0.07	25	0.02
09130317120	Tanacetum vulgare	common tansy	TAVU	0.16	25	0.04
09130317121	Tanacetum vulgare	common tansy	TAVU	0.07	25	0.02
09130317124	Centaurea stoebe	spotted knapweed	CEBI2	0.14	25	0.03
09130317125	Centaurea stoebe	spotted knapweed	CEBI2	25.93	35	9.08
09130317126	Centaurea stoebe	spotted knapweed	CEBI2	0.47	40	0.19
09130317127	Centaurea stoebe	spotted knapweed	CEBI2	0.07	50	0.03
09130317128	Centaurea stoebe	spotted knapweed	CEBI2	0.07	25	0.02
09130317129	Centaurea stoebe	spotted knapweed	CEBI2	0.19	25	0.05
09130317130	Centaurea stoebe	spotted knapweed	CEBI2	3.17	20	0.63
09130317131	Centaurea stoebe	spotted knapweed	CEBI2	0.12	25	0.03
09130317132	Centaurea stoebe	spotted knapweed	CEBI2	3.72	25	0.93
09130317133	Centaurea stoebe	spotted knapweed	CEBI2	0.06	25	0.02
09130317134	Centaurea stoebe	spotted knapweed	CEBI2	0.13	25	0.03
09130317135	Centaurea stoebe	spotted knapweed	CEBI2	1.88	50	0.94
09130317136	Centaurea stoebe	spotted knapweed	CEBI2	0.13	30	0.04
09130317137	Centaurea stoebe	spotted knapweed	CEBI2	0.14	30	0.04
09130317138	Centaurea stoebe	spotted knapweed	CEBI2	0.34	30	0.10
09130317139	Centaurea stoebe	spotted knapweed	CEBI2	17.41	30	5.22
09130317140	Centaurea stoebe	spotted knapweed	CEBI2	15.98	20	3.20
09130317141	Centaurea stoebe	spotted knapweed	CEBI2	5.26	20	1.05
09130317142	Centaurea stoebe	spotted knapweed	CEBI2	0.48	25	0.12
09130317143	Centaurea stoebe	spotted knapweed	CEBI2	0.32	30	0.10
09130317144	Centaurea stoebe	spotted knapweed	CEBI2	0.58	25	0.14
09130317145	Centaurea stoebe	spotted knapweed	CEBI2	13.75	30	4.13
09130317146	Centaurea stoebe	spotted knapweed	CEBI2	0.16	25	0.04
09130317147	Centaurea stoebe	spotted knapweed	CEBI2	1.15	35	0.40
09130317148	Centaurea stoebe	spotted knapweed	CEBI2	2.85	30	0.85
09130317149	Centaurea stoebe	spotted knapweed	CEBI2	2.61	25	0.65
09130317150	Centaurea stoebe	spotted knapweed	CEBI2	0.29	25	0.07
09130317151	Cirsium arvense	Canada thistle	CIAR4	1.13	25	0.28
09130317152	Cirsium arvense	Canada thistle	CIAR4	0.41	25	0.10
09130317153	Cirsium arvense	Canada thistle	CIAR4	0.69	25	0.17
09130317154	Cirsium arvense	Canada thistle	CIAR4	1.99	25	0.50
09130317155	Cirsium arvense	Canada thistle	CIAR4	0.68	30	0.21
09130317156	Cirsium arvense	Canada thistle	CIAR4	0.77	20	0.16
09130317157	Cirsium arvense	Canada thistle	CIAR4	0.59	25	0.15
09130317158	Cirsium arvense	Canada thistle	CIAR4	0.23	25	0.06
09130317159	Cirsium arvense	Canada thistle	CIAR4	0.44	25	0.11
09130317160	Cirsium arvense	Canada thistle	CIAR4	0.88	25	0.22
09130317161	Cirsium arvense	Canada thistle	CIAR4	0.45	30	0.14
09130317162	Cirsium arvense	Canada thistle	CIAR4	0.19	30	0.06
09130317163	Cirsium arvense	Canada thistle	CIAR4	0.07	25	0.02
09130317164	Cirsium arvense	Canada thistle	CIAR4	0.79	30	0.24
09130317165	Cirsium arvense	Canada thistle	CIAR4	0.11	25	0.03
09130317166	Cirsium arvense	Canada thistle	CIAR4	0.48	45	0.22
09130317167	Cirsium arvense	Canada thistle	CIAR4	7.41	25	1.85
09130317168	Cirsium arvense	Canada thistle	CIAR4	8.98	25	2.24
09130317169	Cirsium arvense	Canada thistle	CIAR4	8.90	30	2.67
09130317170	Cirsium arvense	Canada thistle	CIAR4	8.93	40	3.57
09130317171	Cirsium arvense	Canada thistle	CIAR4	0.93	20	0.19
09130317172	Cirsium vulgare	bull thistle	CIVU	1.65	25	0.41
09130317173	Cirsium vulgare	bull thistle	CIVU	2.80	20	0.56

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09130317174	Cirsium vulgare	bull thistle	CIVU	3.12	25	0.78
09130317175	Cirsium vulgare	bull thistle	CIVU	5.12	35	1.79
09130317176	Cirsium vulgare	bull thistle	CIVU	0.50	25	0.13
09130317177	Cirsium vulgare	bull thistle	CIVU	0.26	25	0.07
09130317178	Cirsium vulgare	bull thistle	CIVU	0.73	20	0.15
09130317179	Cirsium vulgare	bull thistle	CIVU	0.16	25	0.04
09130317180	Cirsium vulgare	bull thistle	CIVU	0.47	25	0.12
09130317181	Cirsium vulgare	bull thistle	CIVU	5.23	30	1.57
09130317182	Cirsium vulgare	bull thistle	CIVU	0.46	25	0.11
09130317183	Cirsium vulgare	bull thistle	CIVU	0.28	25	0.07
09130317184	Cirsium vulgare	bull thistle	CIVU	0.57	20	0.11
09130317185	Cirsium vulgare	bull thistle	CIVU	0.46	25	0.12
09130317186	Cirsium vulgare	bull thistle	CIVU	0.45	25	0.11
09130317187	Cirsium vulgare	bull thistle	CIVU	2.60	25	0.65
09130317188	Cirsium vulgare	bull thistle	CIVU	0.19	25	0.05
09130317189	Cirsium vulgare	bull thistle	CIVU	0.24	25	0.06
09130317190	Cirsium vulgare	bull thistle	CIVU	0.26	25	0.06
09130317191	Cirsium vulgare	bull thistle	CIVU	0.62	25	0.16
09130317194	Cirsium vulgare	bull thistle	CIVU	0.17	25	0.04
09130317195	Cirsium vulgare	bull thistle	CIVU	1.81	25	0.45
09130317196	Cirsium vulgare	bull thistle	CIVU	0.32	25	0.08
09130317197	Cirsium vulgare	bull thistle	CIVU	0.64	25	0.16
09130317198	Cirsium vulgare	bull thistle	CIVU	0.84	25	0.21
09130317199	Cirsium vulgare	bull thistle	CIVU	0.18	25	0.04
09130317200	Cirsium vulgare	bull thistle	CIVU	0.34	25	0.09
09130317201	Cirsium vulgare	bull thistle	CIVU	5.80	20	1.16
09130317202	Cirsium vulgare	bull thistle	CIVU	0.32	25	0.08
09130317203	Cirsium vulgare	bull thistle	CIVU	0.25	25	0.06
09130317204	Cirsium vulgare	bull thistle	CIVU	4.43	20	0.89
09130317205	Cirsium vulgare	bull thistle	CIVU	8.90	15	1.33
09130317206	Cirsium vulgare	bull thistle	CIVU	2.54	25	0.64
09130317207	Cirsium vulgare	bull thistle	CIVU	1.01	25	0.25
09130317208	Cirsium vulgare	bull thistle	CIVU	0.49	25	0.12
09130317209	Cirsium vulgare	bull thistle	CIVU	0.58	25	0.15
09130317210	Cirsium palustre	marsh thistle	CIPA6	12.72	25	3.18
09130317211	Cirsium palustre	marsh thistle	CIPA6	0.54	25	0.14
09130317212	Cirsium palustre	marsh thistle	CIPA6	0.99	25	0.25
09130317213	Cirsium palustre	marsh thistle	CIPA6	4.45	25	1.11
09130317214	Cirsium palustre	marsh thistle	CIPA6	40.95	25	10.24
09130317215	Cirsium palustre	marsh thistle	CIPA6	20.94	30	6.28
09130317216	Cirsium palustre	marsh thistle	CIPA6	0.88	25	0.22
09130317217	Cirsium palustre	marsh thistle	CIPA6	0.69	25	0.17
09130317218	Cirsium palustre	marsh thistle	CIPA6	4.34	25	1.09
09130317219	Cirsium palustre	marsh thistle	CIPA6	4.32	60	2.59
09130317220	Cirsium palustre	marsh thistle	CIPA6	0.84	30	0.25
09130317221	Cirsium palustre	marsh thistle	CIPA6	9.81	35	3.43
09130317222	Cirsium palustre	marsh thistle	CIPA6	0.67	25	0.17
09130317223	Cirsium palustre	marsh thistle	CIPA6	0.64	25	0.16
09130317224	Cirsium palustre	marsh thistle	CIPA6	0.45	25	0.11
09130317225	Cirsium palustre	marsh thistle	CIPA6	0.39	25	0.10
09130317226	Cirsium palustre	marsh thistle	CIPA6	1.25	30	0.37
09130317227	Cirsium palustre	marsh thistle	CIPA6	0.49	25	0.12
09130317228	Cirsium palustre	marsh thistle	CIPA6	0.83	25	0.21
09130317229	Cirsium palustre	marsh thistle	CIPA6	0.89	25	0.22
09130317230	Cirsium palustre	marsh thistle	CIPA6	2.00	25	0.50

09130317231	Cirsium palustre	marsh thistle	CIPA6	0.55	25	0.14
09130317232	Cirsium palustre	marsh thistle	CIPA6	0.21	25	0.05
09130317233	Cirsium palustre	marsh thistle	CIPA6	0.68	30	0.21
09130317234	Cirsium palustre	marsh thistle	CIPA6	1.19	30	0.36
09130317235	Cirsium palustre	marsh thistle	CIPA6	2.11	25	0.53
09130317236	Cirsium palustre	marsh thistle	CIPA6	1.00	25	0.25
09130317237	Cirsium palustre	marsh thistle	CIPA6	1.04	25	0.26
09130317238	Cirsium palustre	marsh thistle	CIPA6	1.52	20	0.30
09130317239	Cirsium palustre	marsh thistle	CIPA6	37.00	20	7.40
09130317240	Cirsium palustre	marsh thistle	CIPA6	0.92	25	0.23
09130317241	Cirsium palustre	marsh thistle	CIPA6	1.02	25	0.25
09130317242	Cirsium palustre	marsh thistle	CIPA6	0.21	25	0.05
09130317245	Cirsium palustre	marsh thistle	CIPA6	1.16	25	0.29
09130317246	Cirsium palustre	marsh thistle	CIPA6	2.87	25	0.72
09130317247	Cirsium palustre	marsh thistle	CIPA6	5.66	20	1.13
09130317248	Cirsium palustre	marsh thistle	CIPA6	0.35	25	0.09
09130317249	Cirsium palustre	marsh thistle	CIPA6	0.19	25	0.05
09130317250	Cirsium palustre	marsh thistle	CIPA6	0.40	25	0.10
09130317251	Cirsium palustre	marsh thistle	CIPA6	0.74	25	0.18
09130317252	Cirsium palustre	marsh thistle	CIPA6	1.02	25	0.25
09130317253	Cirsium palustre	marsh thistle	CIPA6	0.18	45	0.08
09130317254	Cirsium palustre	marsh thistle	CIPA6	1.47	30	0.44
09130317255	Cirsium palustre	marsh thistle	CIPA6	0.13	25	0.03
09130317256	Cirsium palustre	marsh thistle	CIPA6	10.17	35	3.56
09130317257	Cirsium palustre	marsh thistle	CIPA6	2.43	25	0.61
09130317258	Cirsium palustre	marsh thistle	CIPA6	1.08	60	0.65
09130317259	Cirsium palustre	marsh thistle	CIPA6	0.13	25	0.03
09130317260	Cirsium palustre	marsh thistle	CIPA6	2.09	35	0.73
09130317261	Cirsium palustre	marsh thistle	CIPA6	0.79	50	0.39
09130317262	Cirsium palustre	marsh thistle	CIPA6	6.60	25	1.65
09130317263	Cirsium palustre	marsh thistle	CIPA6	2.00	25	0.50
09130317264	Cirsium palustre	marsh thistle	CIPA6	0.68	25	0.17
09130317265	Cirsium palustre	marsh thistle	CIPA6	138.25	30	41.48
09130317266	Cirsium palustre	marsh thistle	CIPA6	6.05	25	1.51
09130317267	Cirsium palustre	marsh thistle	CIPA6	0.90	25	0.22
09130317268	Cirsium palustre	marsh thistle	CIPA6	0.53	25	0.13
09130317269	Cirsium palustre	marsh thistle	CIPA6	0.54	25	0.14
09130317270	Cirsium palustre	marsh thistle	CIPA6	1.70	25	0.42
09130317271	Cirsium palustre	marsh thistle	CIPA6	0.36	25	0.09
09130317272	Cirsium palustre	marsh thistle	CIPA6	2.71	25	0.68
09130317273	Cirsium palustre	marsh thistle	CIPA6	2.87	20	0.57
09130317274	Cirsium palustre	marsh thistle	CIPA6	4.68	25	1.17
09130317275	Cirsium palustre	marsh thistle	CIPA6	0.47	25	0.12
09130317276	Cirsium palustre	marsh thistle	CIPA6	1.81	50	0.91
09130317277	Cirsium palustre	marsh thistle	CIPA6	8.90	40	3.56
09130317278	Cirsium palustre	marsh thistle	CIPA6	0.44	25	0.11
09130317279	Cirsium palustre	marsh thistle	CIPA6	0.73	25	0.18
09130317280	Cirsium palustre	marsh thistle	CIPA6	3.18	25	0.79
09130317281	Cirsium palustre	marsh thistle	CIPA6	0.41	35	0.15
09130317282	Cirsium palustre	marsh thistle	CIPA6	0.81	25	0.20
09130317283	Cirsium palustre	marsh thistle	CIPA6	8.24	25	2.06
09130317284	Cirsium palustre	marsh thistle	CIPA6	0.78	25	0.20
09130317285	Cirsium palustre	marsh thistle	CIPA6	5.97	25	1.49
09130317286	Phalaris arundinacea	reed canarygrass	PHAR3	16.36	25	4.09
09130317287	Phalaris arundinacea	reed canarygrass	PHAR3	5.62	25	1.40

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09130317288	Phalaris arundinacea	reed canarygrass	PHAR3	1.34	25	0.34
09130317289	Phalaris arundinacea	reed canarygrass	PHAR3	102.22	25	25.56
09130317290	Phalaris arundinacea	reed canarygrass	PHAR3	5.21	25	1.30
09130317291	Phalaris arundinacea	reed canarygrass	PHAR3	61.67	25	15.42
09130317292	Phalaris arundinacea	reed canarygrass	PHAR3	1.54	25	0.39
09130317293	Phalaris arundinacea	reed canarygrass	PHAR3	8.40	25	2.10
09130317294	Phalaris arundinacea	reed canarygrass	PHAR3	5.04	25	1.26
09130317295	Phalaris arundinacea	reed canarygrass	PHAR3	0.14	25	0.03
09130317296	Phalaris arundinacea	reed canarygrass	PHAR3	2.41	25	0.60
09130317297	Phalaris arundinacea	reed canarygrass	PHAR3	4.21	25	1.05
09130317298	Phalaris arundinacea	reed canarygrass	PHAR3	0.33	25	0.08
09130317299	Phalaris arundinacea	reed canarygrass	PHAR3	3.51	25	0.88
09130317300	Phalaris arundinacea	reed canarygrass	PHAR3	0.40	25	0.10
09130317301	Phalaris arundinacea	reed canarygrass	PHAR3	0.19	25	0.05
09130317302	Cirsium arvense	Canada thistle	CIAR4	0.50	25	0.13
09130317303	Cirsium vulgare	bull thistle	CIVU	0.21	25	0.05
09130317304	Alliaria petiolata	garlic mustard	ALPE4	2.48	50	1.24
09130317305	Alliaria petiolata	garlic mustard	ALPE4	0.17	100	0.17
09130317306	Phalaris arundinacea	reed canarygrass	PHAR3	0.54	25	0.13
09130317307	Phalaris arundinacea	reed canarygrass	PHAR3	4.20	25	1.05
09130317308	Phalaris arundinacea	reed canarygrass	PHAR3	0.25	25	0.06
09130317309	Phalaris arundinacea	reed canarygrass	PHAR3	0.58	25	0.14
09130317310	Phalaris arundinacea	reed canarygrass	PHAR3	0.28	25	0.07
09130317311	Phalaris arundinacea	reed canarygrass	PHAR3	1.36	25	0.34
09130317312	Phalaris arundinacea	reed canarygrass	PHAR3	1.58	25	0.39
09130317313	Phalaris arundinacea	reed canarygrass	PHAR3	0.22	25	0.05
09130317314	Phalaris arundinacea	reed canarygrass	PHAR3	1.06	25	0.27
09130317315	Phalaris arundinacea	reed canarygrass	PHAR3	0.16	25	0.04
09130317318	Phalaris arundinacea	reed canarygrass	PHAR3	24.16	20	4.83
09130317319	Phalaris arundinacea	reed canarygrass	PHAR3	0.07	25	0.02
09130317320	Phalaris arundinacea	reed canarygrass	PHAR3	1.82	25	0.45
09130317331	Phalaris arundinacea	reed canarygrass	PHAR3	0.10	25	0.02
09130317332	Phalaris arundinacea	reed canarygrass	PHAR3	8.30	20	1.66
09130317333	Phalaris arundinacea	reed canarygrass	PHAR3	35.15	25	8.79
09130317334	Phalaris arundinacea	reed canarygrass	PHAR3	3.21	25	0.80
09130317335	Phalaris arundinacea	reed canarygrass	PHAR3	0.29	25	0.07
09130317336	Phalaris arundinacea	reed canarygrass	PHAR3	0.93	25	0.23
09130317337	Phalaris arundinacea	reed canarygrass	PHAR3	0.28	25	0.07
09130317338	Phalaris arundinacea	reed canarygrass	PHAR3	1.36	25	0.34
09130317339	Phalaris arundinacea	reed canarygrass	PHAR3	0.24	25	0.06
09130317340	Phalaris arundinacea	reed canarygrass	PHAR3	9.82	25	2.45
09130317341	Verbascum thapsus	common mullein	VETH	9.24	15	1.39
09130317342	Verbascum thapsus	common mullein	VETH	0.10	5	0.00
09130317343	Verbascum thapsus	common mullein	VETH	0.29	10	0.03
09130317344	Verbascum thapsus	common mullein	VETH	0.12	5	0.01
09130317345	Verbascum thapsus	common mullein	VETH	0.38	5	0.02
09130317346	Verbascum thapsus	common mullein	VETH	0.88	5	0.04
09130317347	Verbascum thapsus	common mullein	VETH	0.26	5	0.01
09130317348	Verbascum thapsus	common mullein	VETH	2.78	10	0.28
09130317349	Verbascum thapsus	common mullein	VETH	0.06	5	0.00
09130317350	Verbascum thapsus	common mullein	VETH	0.40	5	0.02
09130317351	Verbascum thapsus	common mullein	VETH	0.93	5	0.05
09130317352	Verbascum thapsus	common mullein	VETH	0.99	5	0.05
09130317353	Verbascum thapsus	common mullein	VETH	1.10	10	0.11
09130317354	Verbascum thapsus	common mullein	VETH	0.27	5	0.01

09130317355	Verbascum thapsus	common mullein	VETH	0.50	10	0.05
09130317356	Verbascum thapsus	common mullein	VETH	12.17	15	1.83
09130317357	Verbascum thapsus	common mullein	VETH	2.61	15	0.39
09130317358	Verbascum thapsus	common mullein	VETH	1.30	15	0.19
09130317359	Verbascum thapsus	common mullein	VETH	2.07	10	0.21
09130317360	Verbascum thapsus	common mullein	VETH	9.67	15	1.45
09130317361	Verbascum thapsus	common mullein	VETH	0.80	10	0.08
09130317362	Verbascum thapsus	common mullein	VETH	0.86	5	0.04
09130317363	Verbascum thapsus	common mullein	VETH	0.32	5	0.02
09130317364	Verbascum thapsus	common mullein	VETH	0.49	5	0.02
09130317365	Verbascum thapsus	common mullein	VETH	0.36	5	0.02
09130317366	Verbascum thapsus	common mullein	VETH	5.12	10	0.51
09130317367	Verbascum thapsus	common mullein	VETH	1.99	10	0.20
09130317368	Verbascum thapsus	common mullein	VETH	0.31	5	0.02
09130317369	Verbascum thapsus	common mullein	VETH	0.74	10	0.07
09130317370	Verbascum thapsus	common mullein	VETH	0.18	5	0.01
09130317371	Verbascum thapsus	common mullein	VETH	27.50	20	5.50
09130317372	Verbascum thapsus	common mullein	VETH	13.91	10	1.39
09130317373	Verbascum thapsus	common mullein	VETH	0.20	5	0.01
09130317374	Verbascum thapsus	common mullein	VETH	0.29	5	0.01
09130317375	Verbascum thapsus	common mullein	VETH	3.77	10	0.38
09130317377	Verbascum thapsus	common mullein	VETH	0.56	10	0.06
09130317378	Verbascum thapsus	common mullein	VETH	1.08	15	0.16
09130317379	Verbascum thapsus	common mullein	VETH	0.45	10	0.04
09130317380	Verbascum thapsus	common mullein	VETH	0.13	5	0.01
09130317381	Verbascum thapsus	common mullein	VETH	0.92	5	0.05
09130317382	Verbascum thapsus	common mullein	VETH	0.39	10	0.04
09130317383	Verbascum thapsus	common mullein	VETH	17.85	15	2.68
09130317384	Verbascum thapsus	common mullein	VETH	20.85	15	3.13
09130317385	Verbascum thapsus	common mullein	VETH	19.39	10	1.94
09130317386	Verbascum thapsus	common mullein	VETH	0.89	5	0.04
09130317387	Verbascum thapsus	common mullein	VETH	0.56	5	0.03
09130317388	Verbascum thapsus	common mullein	VETH	0.67	5	0.03
09130317389	Verbascum thapsus	common mullein	VETH	0.10	15	0.01
09130317390	Verbascum thapsus	common mullein	VETH	8.90	15	1.33
09130317391	Verbascum thapsus	common mullein	VETH	1.57	10	0.16
09130317392	Verbascum thapsus	common mullein	VETH	0.36	5	0.02
09130317393	Verbascum thapsus	common mullein	VETH	0.64	5	0.03
09130318282	Alliaria petiolata	garlic mustard	ALPE4	15.76	100	15.76
09130318283	Cirsium arvense	Canada thistle	CIAR4	0.25	100	0.25
09130318284	Cirsium arvense	Canada thistle	CIAR4	0.10	100	0.10
09130318285	Cirsium arvense	Canada thistle	CIAR4	0.00	100	0.00
09130318286	Cirsium arvense	Canada thistle	CIAR4	0.00	100	0.00
09130318287	Cirsium arvense	Canada thistle	CIAR4	0.10	100	0.10
09130318288	Verbascum thapsus	common mullein	VETH	0.50	100	0.50
09130318289	Cirsium palustre	marsh thistle	CIPA6	0.34	33	0.11
09130318290	Cirsium palustre	marsh thistle	CIPA6	0.32	100	0.32
09130318291	Cirsium palustre	marsh thistle	CIPA6	0.50	100	0.50
09130318292	Cirsium palustre	marsh thistle	CIPA6	0.14	100	0.14
09130318293	Cirsium palustre	marsh thistle	CIPA6	0.11	50	0.06
09130318294	Cirsium palustre	marsh thistle	CIPA6	0.10	50	0.05
09130318295	Cirsium palustre	marsh thistle	CIPA6	1.16	100	1.16
09130318296	Cirsium palustre	marsh thistle	CIPA6	0.01	50	0.01
09130318297	Cirsium palustre	marsh thistle	CIPA6	0.11	1	0.00
09130318298	Cirsium palustre	marsh thistle	CIPA6	0.20	30	0.06

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09130318299	Cirsium palustre	marsh thistle	CIPA6	0.05	100	0.05
09130318300	Cirsium palustre	marsh thistle	CIPA6	0.01	10	0.00
09130318301	Cirsium palustre	marsh thistle	CIPA6	0.01	10	0.00
09130318302	Cirsium palustre	marsh thistle	CIPA6	0.00	100	0.00
09130318303	Cirsium palustre	marsh thistle	CIPA6	0.00	100	0.00
09130318304	Cirsium palustre	marsh thistle	CIPA6	0.19	10	0.02
09130318305	Cirsium palustre	marsh thistle	CIPA6	0.01	50	0.01
09130318306	Cirsium palustre	marsh thistle	CIPA6	0.01	50	0.01
09130318307	Alliaria petiolata	garlic mustard	ALPE4	11.36	50	5.68
09130318316	Verbascum thapsus	common mullein	VETH	1.68	50	0.84
09130318317	Verbascum thapsus	common mullein	VETH	1.56	40	0.63
09130318320	Cirsium palustre	marsh thistle	CIPA6	0.00	100	0.00
09130318321	Berberis thunbergii	Japanese barberry	BETH	0.00	100	0.00
09130403002	Phalaris arundinacea	reed canarygrass	PHAR3	0.03	100	0.03
09130409222	Cirsium palustre	marsh thistle	CIPA6	0.83	5	0.04
09130409223	Cirsium vulgare	bull thistle	CIVU	0.81	10	0.08
09130410090	Cirsium vulgare	bull thistle	CIVU	0.00	100	0.00
09130410091	Cirsium palustre	marsh thistle	CIPA6	1.03	15	0.15